A HANDBOOK OF NURSING

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BY

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PREFACE

This little book contains the substance of the teaching given to the probationer nurses of Guy's Hospital by the lecturers on Nursing, Surgery, and Medicine.

I have been allowed, by the great kindness of Mr Bellingham Smith and Dr J. H. Bryant, to make use of notes of their lectures on Surgery and Medicine; and the Editor of the *Guy's Hospital Gazette* has given me permission to include a chapter on Asepsis, taken from an article in that journal.

I have also to thank Dr Perry for much kind help and advice in preparing the lectures for publication.

M. N. O.

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A

HANDBOOK OF NURSING

PART I

CHAPTER I

THERE was a little book printed in black-letter type, and published in 1557, which set forth, in quaint language and curious spelling, the duties of the officers of the hospitals of King Henry VIII. and King Edward VI., beginning with the duties of the governors, and ending with the charges of the beadles, cooks, and porters. The chapter relating to the nurses' charge puts, in a few words, nearly the whole duty of a hospital nurse, as it remains now, more than three centuries later. The following paragraphs are taken from "The Charge of the Nurses and Keepers of the Wards," the spelling only being modernised.

"Your charge is faithfully and truly to serve in this house, to obey the matron thereof.

"Ye shall also fly and eschew all railing, scolding, swearing, and drunkenness.

"Ye shall in your behaviour be virtuous, loving, and diligent.

"Ye shall also carefully and diligently oversee, keep, and govern, all those tender babes and younglings that shall be committed to your charge, and the same wholesomely, cleanly, and sweetly, nourish and bring up.

"And in like manner shall ye keep your wards and every part thereof sweet and clean.

"Ye shall also, to avoid all idleness, when your charge and care of keeping the children is past, occupy yourselves in spinning,

sewing, mending of sheets and shirts, or some other virtuous exercise, such as you shall be appointed unto.

"Ye shall . . . see that all your children, before they be brought to bed, be washed and clean, and immediately after, every [one] of you quietly shall go to your bed, and not to sit up any longer.

"These are the especial parts of your charge, which ye shall endeavour with all your powers to observe and keep, or else ye shall . . . be expulsed and banished this House for ever. And whatsoever faults ye shall perceive in any other officers in this House, the same ye shall declare unto the Governors, and not otherwise meddle or make but in your own business."

Although nearly everything essential in a good nurse is mentioned in this charge, nothing is said there about the standard of education required of her. It was probably a low standard, and the nurses were most likely but little acquainted with reading or writing. We are accustomed to think these quite as necessary for a hospital nurse as "spinning and sewing," but for hundreds of years the hospitals were nursed, and probably well nursed, by women without any knowledge of either. So lately as 1828 a London hospital chaplain wrote in his official diary: "Finding the difficulty of obtaining creditable women for assistant nurses, who can write, I have thought proper to suggest that it would be better to relax from the plan requiring all to write. It is found that only the very refuse who can write offer themselves for such situations, whereas of those that cannot write, very creditable and suitable might be obtained; and the possibility of danger may be obviated by requiring the *nurse* to get up whenever medicine is required to be given during the night, which is found not to occur, on an average, more than once a week in each ward." This evidently implies that the assistant nurse was not to be expected even to read the directions on a medicine bottle. We nowadays believe that the better education a nurse starts her work with, the better she is fitted for it, for she can take a more intelligent interest in it if she understands something at least of the *principles* of her work, knowing the why and wherefore of the things she is expected to do for her patients,

and something about the diseases they are suffering from, and of the drugs and other means that are used in hope of their alleviation. Besides this, if, for instance, she has a knowledge of some other language than her own, she will often find it useful to be able to talk to a foreigner among her patients in his own tongue; a nurse who can sing or play is often called on to use her talent, and one who can read aloud in a pleasant voice can generally find occupation, while a nurse who can frame a patient's vague ideas into a readable and understandable form is always in request for letter-writing.

A recent writer in the *Lancet* has outlined distinctly the qualities and qualifications that are expected nowadays of a "hospital-trained nurse." He says:—

"Anything which approximates the training of the nurse to that of the medical student is to be avoided; with the one will rest the responsibility of diagnosis and treatment, with the other the accepting of the diagnosis and the carrying through of the prescribed treatment. When this fact is firmly grasped, it will be evident that the medical student and the nurse approach their work from different points of view. A thorough acquaintance with the structure of the body, and the various influences to which it is subjected, are the necessary equipments of the doctor; for the nurse a knowledge of the laws of life and health, of the functions of the various organs of the body and the outlines of its anatomy, would fit her for an intelligent performance of her duties and leave her ample leisure to make herself proficient in those bed-side duties on which depend the comfort and well-being of her patient. Such a grounding would lead to the development of those qualities of observation, perception, and accurate reasoning which are the essential characteristics of a good nurse, and when united to steady obedience and unswerving loyalty, make all the difference between an intelligent and a mechanical nurse. Over and above these qualifications are those intangible qualities—womanliness, sympathy, gentleness, tact, and refinement—qualities which cannot be catalogued but which lie at the root of all sick nursing, and which are fast being lost in the hurry and cram of modern hospital life. Considering the very varied fields of work now open

to the nurses, whether it be the hospital, the district, the workhouse, or private patients, and not taking into account the demand for nurses abroad and in the colonies, it seems that the training should fit the nurse to be the doctor's handmaid, and should to a certain extent prepare her for the life before her when she leaves the hospital."

There is not much doubt that a "born nurse" makes the best trained nurse, if only she will submit to go through the necessary training, for we cannot help doing our best at the most congenial work. The prejudice that professional nurses have against the "born nurse" appears to arise from the fact that the latter often makes a natural aptitude for the work take the place of learning its details.

It is also the women who are accustomed to work who make the best nurses; but not those who have been failures in other professions. It was a wise woman who said to a candidate for a place as probationer, who smiled rather scornfully when asked if she had ever done any practical work, "Go home and do the housemaid's work for three months, and then come back, and I will see if you are worth training." For nursing *is* hard work, and it is a good thing to get one's muscles in trim before beginning it.

If a probationer comes to the hospital with a capability for hard work, with good health, a cheerful disposition, and a good memory, and with habits of order, method, neatness, and cleanliness, she is good material for training, especially if she also has a liking for sick people. If she comes without these qualifications, they will have to be acquired in addition to all that she has to learn about nursing, and her difficulties will be more than doubled. But the liking for her work seldom grows unless there is an instinctive love of making sick folks comfortable; unless, in short, she is a "born nurse."

It is wonderful how far the first three months' work in a ward varies from the new probationer's pre-conceived ideas of it. She has to be contented to learn by easy steps, and to begin at the beginning; and, instead of attending the surgeons at great operations, and sitting by the bed-side of the most interesting patient in the ward, she discovers that she is not trusted with any real

nursing at all, unless it may be a convalescent child to look after, or some one who needs no skilled attention; and she finds that the greater part of the day is occupied with bed-making, distributing the various meals, and keeping the ward clean. She is at first almost useless as a nurse, for she does not know what she may and may not do for a patient; and if she has the power of observation well developed, she does not know which thing it is necessary to observe among the hundred new things that present themselves to her. She will not, probably, even notice the crooked quilt, or the newspaper on the floor; much less will she see the typhoid child munching a biscuit that his neighbour has thrown over to him, or the pillow that has slipped from under the arm of the patient with a bad fracture. In walking round the ward, she will not notice a third of the things that she will see in two or three years' time, if she has proved herself worth the training. She must have her day of small things, and should be content to remember that when everything is new to her, she can get hold of some fresh bit of knowledge and experience every day. So, if she is wise, she will scrub the bedstead and fold the clean linen in a way which will satisfy the most exacting task-mistress, while at the same time she has an observant eye to notice the way in which the head nurse is coaxing a sick baby to take its medicine, or to watch another who is preparing a table for an operation.

The new probationer has things to learn that she never anticipated when she arrived at the hospital. She must be able to look at repulsive sights without hurting the feelings of the patient by letting him see her repugnance. She will have to conquer her fear of delirious patients, at any rate so far as to hide it; for if a patient once knows that a nurse is afraid of him, especially in mental cases, her power over him is gone. But it is by her wits that she must learn to manage him, and not by her physical strength, which is nearly certainly inferior to his.

Above all, she must have an inexhaustible supply of patience. This is very easy to say; but, in practice, it is difficult enough to keep temper and voice under control, when, for instance, a homesick child is keeping a whole ward of sick people awake at night

with its crying, that nothing will pacify; and it takes the principle of patience to go quietly, for the twentieth time in an hour, it may be, to answer the querulous and often-repeated call of an old man, who thinks she is not giving him enough of her attention, and invents reasons for calling her away from her work.

Obedience, too, or rather faithfulness in carrying out orders in the spirit in which they were given, is essential, if a nurse is to be considered trustworthy. And of all the moral virtues she needs, perhaps none is more necessary than the habit of speaking the exact truth, without exaggeration or misrepresentation. Both doctor and patient ought to be able to rely confidently on her statements.

The hospital etiquette for nurses is simple enough, and does not vary much from what holds good in private life. The nurse stands in the presence of the visiting staff, the governors, treasurer, superintendent, and matron; she should also stand to receive orders from the resident medical officers, the sister, and the nurse who may be in authority over her for the time being. She will naturally not leave visitors waiting at the door, wondering where to go next, but will find out what they want, showing the same courtesy to the poor woman bringing in her son's Sunday shirt as to the "man with a gold ring, in goodly apparel." Visitors who come in for the purpose of seeing the wards, either out of interest or curiosity, will generally be pleased if one of the nursing staff will accompany them round the ward to answer their questions; but this duty will not fall to the share of the probationer. It is rarely wrong to admit a clergyman at once, unless there is some reason, obvious to everyone, that it is not possible.

But the nurse must be particular to attend, above all, with the greatest promptitude to any new patient who comes into the ward. Neglect in this respect is not forgotten by the mother or wife who brings in the one that she has been tending for weeks before she could make up her mind to give him into any other person's charge. Perhaps only those who have gone through it know *how* long a quarter of an hour can stretch itself out, when they are waiting in anxiety, and maybe in pain, without any

notice being taken of the new arrival. It is a notable fact in the patient's own history; and it gives considerable reason for his friends to speak ill of the hospital, if they are left waiting unattended, if they see a contemptuous glance, and perhaps hear, "Oh!—only another chronic." At the same time it shows an equal want of propriety, and bad management in the ward, if all the nurses rush together to receive a child with a bad burn, or a man with a cut throat, or if they flock all at the same moment to see anything interesting in the ward. A nurse must not run about her ward, though she should have her eyes and ears everywhere: quietness is necessary for sick people, and is quite compatible with quickness, while hurry and excitability on the nurse's part excite the patient too, and do not at all conduce to that confidence in her which she should try to establish.

The probationer reports herself to the sister or head nurse when coming on and going off duty; and punctuality in going as well as coming should be her rule. If any special duty, such as filling an icebag, or giving a stimulant, has to be done in her absence by some one else, she must tell the responsible person exactly what has to be done, and at what time.

A good nurse upholds the authority of the hospital to her patients, and is as far from listening to any criticism of the doctor's treatment as of venturing on it herself. She stops bad language (one of the original rules of the hospital sets forth that patients are to be discharged if they use "ill language"), and she prevents grumbling as much as she can. She does not "spoil" one patient by granting him extra privileges; such a proceeding is always commented on and resented by the less favoured ones; and she bears herself so that even the most discourteous treat her with respect. She raises the tone of the ward by her demeanour at prayer time; if the nurse does not take the trouble to join in the service, neither will the patients. Nurses hardly realise *how* much influence they have on their patients, as much perhaps by their actions as their words, but if they can unite both, it is a happy thing for them. "Sister says," "Nurse says," are words continually heard in the wards.

Her dress should be neat, and should conform exactly to the

rules of the hospital. Rustling petticoats and jingling châtelaines are quite out of place on her, and squeaking shoes are a great annoyance to patients. High-heeled shoes are also unadvisable; they are too noisy for an uncarpeted ward, and are tiring to the feet. Very thin shoes are equally tiring.

A nurse should take every reasonable opportunity of resting her feet. She must necessarily be on them when at work, and it is not laziness to put them up for a rest when off duty. Ten minutes' lying-down rest is worth twenty minutes of sitting up in a chair. She should be particularly careful of her feet at first, for many nursing careers have been cut short at the beginning by flat foot resulting from too much standing. It is a good plan to change the shoes once or twice a day, or, at any rate, not to wear the same pair two days running.

The same regulations that apply to those nursing infectious diseases apply more or less to every hospital nurse. She must be careful to wash her hands before going to meals, and to avoid talking and to keep her mouth closed when attending to phthisical and other infectious patients. There is no excuse for her to neglect the least sore throat, for remedies of all sorts can be had at a minute's notice in the hospital; and she must be careful of any scratches about her hands or face, lest they become poisoned. When nursing diphtheria she should gargle her throat before going to meals, and she must not kiss even the most fascinating of infectious babies. She should get some fresh air daily while with an infectious case, and this means every day while she is in the hospital, for there is not a ward, medical or surgical, without tuberculous cases in it.

It is wise for a nurse to keep to regular meal times; they will do her more good than the betwixt and between cups of tea which may stimulate and whip her up for the time being, but have no real food in them, except a spoonful of milk and a bit of sugar. It is said to interfere with the digestion of meat if tea is drunk directly after eating it. And tea that has been "stewed" is not fit to drink at all.

Take a cold bath *every* morning if you can manage it; it will prevent you from taking many a cold and other small ailment.

Ventilate the room you work in, as much for your own sake as the patient's; and never sleep in a room with the windows shut. A well ventilated bedroom is better than many sleeping draughts, and saves a headache the next morning.

It is a pity for a nurse to be addicted to much taking of medicine; if she cannot do her work without doses of "Mist. Acidi Co.," or antipyrine, or ammonia mixture, it is time that she either had some help with her work, or that she had a holiday.

CHAPTER II

WARD WORK

THE probationer's ward work, meaning household work, and not actual nursing, consists largely of cleaning. This is such a necessary part of the day's duties that it is likely that the probationer gets less credit when it is well done, than blame when it is neglected. But this part of the hospital routine must be gone through thoroughly every day. It is wonderful, almost incredible to country people, as most hospital nurses are, how soon dirt collects in London; and where dirt and dust collect, there the insect population will abound, to our great discomfort and discredit; and there also, we are taught, are the germs of many hideous and deadly diseases, invisible to us, but just as really there as the motes, which we can only see in the sunshine, are yet always present in the air we breathe. Besides these motives for cleanliness, we might consider the moral effects on our patients and their friends of a good example of cleanliness and neatness. For many, perhaps most of them, come from homes conspicuous for dirt and untidiness.

Sweeping and dusting do not come by instinct. They have to be learnt, like everything else that is worth the doing. The wards have to be swept, the whole floor being gone over, twice a day, the night probationer doing it after the beds are made in the morning, and the day probationer sweeping after dinner, when the ward is being prepared for the doctor's visit. It is not easy to some of us even to handle a broom for the first time, and when that is learnt, and it is understood that every inch of the floor is to be swept, there are some other points to be considered. Do not sweep in such a draught that all the dust is blown about the ward again as fast as the broom collects it; and do not sweep before all the beds are made, or there will be another collection of fluff to spoil the effect of what has been done.

Move all the furniture except the beds and the book-cases. Remember the corners behind the screens, the space between the wall and the legs of the bedsteads, and the places under the coal lockers. And that you swept out all these places yesterday is no reason why they do not need to be done again to-day. When you have finished, collect all the dust carefully in a dustpan, and burn it. It is generally better to begin at one end of the ward and sweep to the middle, and then start again at the opposite end and sweep to the middle of the ward from that direction, so that you do not take all the dust the whole length of the ward. Then when the sweeping is finished, and the fires are made up, the dusting has to be done, and skill can be brought to bear even on such a simple business as this. Use a clean duster, and wipe up the dust into it, so that the duster is black by the time you have finished. Don't flick the cloth at the furniture, as if you were flicking flies off a window; and move everything on table or window-sill to dust the place where it stands. This sounds like a tedious affair, but hospital furniture is very simple, and the ward is not encumbered with ornaments, except a few flower-pots and vases, which take very little time and trouble to move. Try to see every place where dust is likely to lodge, and remove the dust. Remember the tops and ledges of screens, the frames of pictures, the inside of the mackintosh stand, the bed-top of the patient with bronchitis; this must be taken down and shaken, *not* in the ward, once a week. There is nothing that keeps a ward clean but constant regular routing out of the dirt; there is nothing that keeps it sweet but constant and regular ventilation. Cupboards are in many houses harbours for rubbish, and the refuge of the untidy, but hospital cupboards are all reserved for their special contents, and have to be kept in perfect order, each thing in its own place, so that you can put your hand on the thing you want, even in the dark. Each cupboard and drawer in the ward should be in the charge of some one who will be responsible for it: one having the charge of the medicine cupboard, and seeing that the bottles are kept full, the labels clean, etc.; another taking the linen cupboard, sorting the different articles and putting them neatly in their places, and taking care

that irresponsible persons do not upset all her tidy arrangements, by pulling down piles of things to look for something wanted in a hurry. Tiled lockers and window-sills need washing with soap and water every day, and tables that are usually covered with a cloth must be scrubbed once a week. The walls of the ward have also to be swept weekly with a long-handled broom, which is better used with a cloth tied over the bristles. It is not the work of the probationer to clean the sinks and sluices, but it is her work, when she becomes the head of a ward, to see that they are kept thoroughly clean and bright, and well flushed out with hot water two or three times a day. Disinfectants should also be used daily.

When you wash porringers and spit-cups, use plenty of hot water, and leave no dirt round the handles. The spit-cups should always be scalded out in boiling water. Cold water from the tap just turned on them does not half clean them, to say nothing of disinfecting them. The tops and handles want careful washing, as the sputum on them is sticky, and not easily got rid of. In washing glass things use warm water and soap, and dry them thoroughly with a clean cloth, or they will be smeary and cloudy. A soft wash-leather polishes them nicely. Urine bottles are troublesome to keep sweet. If there are enough of them, it is a good plan to use two alternately for the same patient, and to keep one filled with a disinfectant solution while the other is in use. Or, if you are in a hurry, pour in a few drops of nitric acid, and swill it well round with some water, and be careful in handling the acid that none is spilt. Bed-pans must also be kept scrupulously clean, by the plentiful use of water and a small mop. A brush is sometimes used for the handles, otherwise it is difficult to get at the inside of them; and they should be kept literally as clean inside as out. You have also much scope for your cleansing energies in scrubbing mackintoshes. Scrub them on a large firm table where you can put some pressure on it without doing damage, and cover the table with a clean white cloth, unless it has itself been freshly scrubbed. You will find the mackintoshes much easier to clean if you put them into cold water directly they are

soiled, until you have the opportunity of scrubbing them, instead of letting everything dry on them. And put them away as soon as they are dry, or they will collect more dirt. We have stands provided for keeping the mackintoshes in, where they are hung over a rail, for nothing destroys a mackintosh more quickly than being folded—the folds soon crack, and the mackintosh is no longer water-tight. Another duty that falls to the probationer's share is to keep the head boards of the bed clean. The whole bedstead has to be washed and carbolised whenever the sacking is removed, but the head board will probably often need it at other times. A little ammonia added to soap and water cleanses paint and other things quickly.

CHAPTER III

BEDS, CLOTHING, VENTILATION

THE making of beds takes up a good deal of time in the day's routine, and much of the patient's comfort or discomfort depends on the way it is done. The ordinary hospital bed is most convenient for nursing; it is low, which makes it easy for a nurse to lift her patient, and narrow, being only three feet wide, so that she can reach him conveniently from either side, and it is steady, as it is of iron, without any castors to slip about. But one merit of the large beds that nurses in private houses have to use, is that the patient may often, if not able to get out of bed, be moved night and morning from one side of the bed to the other, thus giving him a fresh cool place to lie on. But perhaps a better plan than this for private nursing is to have two small beds in the room, and to lift your patient from one to the other night and morning.

In hospitals we have not much choice as to the position of our patients. We try to keep a quiet, out-of-the-way bed for a concussion case, and one well sheltered from any draught for an old bronchitic patient, and we must put a delirious patient into a bed where he can be constantly watched. But in private nursing you may often be able to choose, not only the position of the bed, but also the room itself. Then choose a room that has some sunshine in it, and arrange the bed so that the patient can see at least a bit of sky out of window, and, at the same time, do not let the bed face the full glare of the sun. Put the bed in such a position that you can get at your patient from either side. A good-sized folding screen is a great advantage in an ordinary bedroom; and if a screen is not at hand, you can easily improvise one with a large clothes-horse and a sheet. It will protect your patient from draughts when the room is

having an extra airing, and will prevent visitors from walking straight into the room at inconvenient moments.

A spring bed with a hair mattress over it is by far the best for a sick person. These are not always to be had in the wards, so we reserve them if possible for those who cannot get up every day to have their flock beds shaken, for such cases as typhoids or abdominal sections. When you turn a mattress in making a bed, turn it from top to bottom, and not from side to side, that it may be more evenly worn out. Use a thin blanket next the mattress, not put on double, though it may be a little less trouble, or it will wear out in two places instead of one. It is much better to put all bolsters and pillows in cases, instead of rolling them in the sheet, as they can be more conveniently taken out and shaken. And never shake a pillow on the bed; as you ought not to want to shake the patient in addition to his pillows. Use a draw-sheet across the middle of the bed as a routine thing whenever the patient is kept entirely in bed. It often saves a whole clean sheet, and gives a fresh feeling to the bed if it is pulled through occasionally. A mackintosh should be used under the draw-sheet when it is necessary, but only when necessary, for it is not very comfortable, and rather encourages bedsores than not, by hindering the perspiration from passing off into the bedclothes. But there are many cases where a mackintosh must always be used—*e.g.* for children, paralysed persons, those subject to fits, and for such persons as must be very still in bed, and so are less able to help themselves. For patients who must not be moved frequently to have their draw-sheet pulled through, it is a good plan to fasten sheet and mackintosh with two or three safety pins to each side of the mattress. This keeps them in place, and free from wrinkles. The lower blanket and sheets must be tucked well in before the upper bed-clothes are put on, or the bed will never be tidy. If the top blanket is too long, tuck it in at the foot of the bed, or double it over the patient's feet, but do not turn it down much, if at all, over his chest. Put the quilt on straight, with the corners clearing the ground, and let all the beds in the ward have a uniform appearance as far as possible. See

that the curtains hang tidily. Allow *nothing*, except a handkerchief, under the pillow.

There is a great art in arranging pillows, and it takes a good deal of practice to prop a man up, so that he can rest comfortably. If they need re-arranging, take them all out and shake them. Put the lowest one against the patient's back and support it well, and fill up the space between him and the back of the bedstead with good, firm pillows. The hospital flock pillows are more efficacious for this than soft feather ones, but keep a soft one for the head. Take trouble to get them just right; an extra pillow or two in the right place will often mean the difference between a comfortable night and one spent in misery. Four flock pillows and a feather one are quite enough to prop up any patient. It is equally necessary to see that children are not allowed to sit up against high pillows which would do well for an adult.

A heavy quilt is unsuitable for any sick person, but especially for a child. If it cannot be dispensed with on a child's bed, for the sake of appearance, turn it down so low that it will only lie on his feet, and make it tidy with a sheet and blanket only on the upper part of the bed. A clean sheet is a good substitute for a quilt in private nursing.

It is difficult in a hospital to air the beds properly, for, as soon as the patient is out of bed, we want to make the ward look tidy by covering it up directly. We are always ready to air sheets and clothes when they come from the laundry, but we too often forget to air the beds in constant use. A man lying in bed all day will probably perspire nearly to the amount of a pint—it may be much more—and nearly all this moisture will have passed into the bed-clothes, and these will really be damp. We are obliged to change all the bedding frequently, partly for want of satisfactory airing arrangements, but we can do a little towards freshening the beds every day. When a patient has got up, do not leave the clothes pulled up to the top of the bed, and the curtains drawn round till the instant you are ready to make the bed, but throw the curtains back, and turn off the clothes, one by one, on a chair. Half-a-dozen beds cannot

be made at the same moment, and they may as well have the benefit of even a few minutes' airing.

When the patient is sitting up to have his bed made, see that he is not sitting in a draught, that he is kept warm with a blanket round him, and that his bare feet are not on the cold floor. If there is a hot-water-bottle in the bed, it will make a convenient footstool for him.

It is the rule in hospital that those patients who are not able to sit out to have their beds made shall be lifted, twice a week, on to a stretcher, while clean sheets, etc. are put on the bed. Four persons are necessary to do this efficiently, as a patient who is ill enough to be kept in bed entirely must be moved gently and steadily, whether a fracture, fever, or operation case. Sometimes we are obliged to change the lower sheet with the patient still in bed. The clean sheet is opened and rolled up lengthways for half its width; the sheet to be removed is untucked from the mattress and rolled up also, until it lies close against the patient, who should be turned on his side, if he can be moved. Then take the clean sheet, with the rolled part uppermost, and lay it against the soiled sheet, and tuck it in at the edge. Then roll the patient back over the two sheets on the other side, pull the dirty one altogether away, and unroll the clean one and tuck it in. If the patient may not turn over, get someone to help you to lift him an inch or two off the bed while you push the sheets through under him. It occasionally happens that it is convenient to put in the clean sheet at the head of the bed, as in the case of a patient with both legs in splints. To do this, roll the sheet shortways and lay it along the bolster, tuck it in at the top of the bed, and help the patient lift himself with the "pulley," while you unroll the sheet to the foot. Two persons can make a bed in this way better than one, if the patient is very heavy or helpless.

Fracture beds are made with boards lying across the ordinary bedstead, to keep the bed level and steady, and to prevent its sinking in at the middle, and a firm fracture mattress is laid on the boards. The mattress is often made in three pieces, so that one part can be taken out at a time and turned.

Water-beds are used chiefly for spinal cases and paralysis. Prepare the bedstead with boards, as for a fracture-bed, unless you can rely on the sacking and cord as being new and strong, for a water-bed is heavy. The boards make the bed rather too high to be convenient for most nurses. Lay a flock-bed as flat as possible on the bedstead, and the empty water-bed on it, and fill it nearly full from a tub of warm water. These indiarubber beds are very expensive, and easily damaged, and it is well to see that they are not dragged about, and that safety or other pins are not stuck into them when the sheet is being adjusted. Anything greasy also spoils indiarubber, and the bed must be covered with a thick blanket, in case any ointment, etc., used for the patient's skin, should get on it. It must always be well scrubbed when done with, and dried thoroughly before it is put away. Water-pillows, or half-beds, are less clumsy to manage than whole beds, and are sufficient for many patients. There is rather a difficulty in keeping them from slipping down in the bed. Make a flat place in the flock-bed just where you want the water-pillow, and pull it up a little from day to day as it slips. To fill a water-pillow, lay it on a strong sheet on a table, and pour in warm water until you can just feel the table by pressing one hand down in the middle of the pillow. If you can get two hands down to the table it is not full enough, and will not answer its purpose, which is to keep the patient's back off the hard bed, and to keep it from always pressing in the same place. Screw the top on tightly, and carry the pillow in the sheet to the bed, so that you do not damage it by dragging at the neck. Tuck the lower blanket in well round the top and two sides of the water-pillow. After using it for two or three weeks you will often find that it needs another jug or two of water to replace what has evaporated. Some nurses think it a good plan to add some carbolic lotion to the water used.

When a patient is kept in bed altogether, he is apt to think that a change of clothes once a week is quite often enough. The nurse's view will be that his clothes should be changed twice daily, keeping different sets for night and day. It is difficult to manage this in hospital, when so few of our patients are provided

with night-shirts at all, except in the case of children, who should always have their clothes changed when they are being washed and settled up for the night, as well as in the morning. For adults, it is a good plan to hang their shirts in front of the fire for a few minutes while the patient is being washed, or at least to hang them over the screen you are using at the bed-side. But for cases where there is much perspiration, such as rheumatism and phthisis, the shirts must be thoroughly dried before being put on again. Remember that the clothing worn next the skin in these cases should be woollen. Woollen stuff, such as flannel, is warm, and has the peculiar property of allowing the moisture from the skin to pass through it to the surface of the clothes, where it evaporates. You can easily see this in any patient who sweats much, if he has a cotton shirt over a woollen one; the flannel next his skin will be comparatively dry, while the cotton garment on the top retains the moisture and is quite damp. This is the reason why flannel is so superior to flannellette, which is a cotton material. Flannellette is warm and woolly feeling, but the perspiration does not pass through it, and remains in the garment, leaving the patient chilly in a damp shirt.

See that he is properly clothed when he gets up for the first time. He will need warm socks and a thick dressing-gown, and, if the weather is cold, a rug tucked in round his knees.

Ventilation of the ward is a rather difficult problem. Not one patient in fifty will look grateful for an open window, and you will often hear piteous entreaties to have the windows shut. You know that the windows must be opened to get rid of the foul air, for your own sake as well as the patient's, but it is generally useless to argue the point with them, and explain that they are much more likely to get bad throats if the windows are shut, than bad colds if they are open. Open them quite early every morning, and in mild weather one or two can be kept open all night, protecting the patients exposed to draughts by screens, curtains, and, if necessary, a bed-top.

A patient should never be allowed to open or shut a window, this business is in the hands of the head nurse of the ward, not even probationers interfering with it without orders. Let the

patients have plenty of blankets and hot-bottles if need be, but do see that there is always fresh air in the ward. Keep the temperature between 60 and 65 degrees. Open the windows chiefly on that side of the ward opposite to the direction of the wind.

CHAPTER IV

FEEDING

IT has been pointed out that to "nurse" and to "nourish" were at first identical terms. We say now that a mother "nurses" her baby when she suckles it, and Shakespeare used the word "nourish" when he meant a nurse, so it is clear that there is a close connection between nursing and feeding. Miss Nightingale says "that incomparably the most important office of the nurse, after she has provided good air for her patient to breathe, is to take care to observe the effect of his food, and to report it to the doctor." What food to give, when and how to give it, are questions that are always coming before us.

There are three diets recognised in the hospital for the patients—full, farinaceous, and milk. The full diet consists of six ounces of meat, twelve ounces of bread, one ounce of butter, a pint of milk, half-a-pound of potatoes; with half-a-pound of rice pudding and half-a-pint of mutton broth on alternate days, and tea and sugar with breakfast and tea. Sometimes this diet is varied by fish or chicken being given instead of meat.

A good deal of discretion is needed in serving out the meals. The wholesome, plentiful food that hospital patients get increases very often their chance of recovery. This is especially the case with badly-fed children, who come in with no ideas of food, except a "bit of bread," "a drop of beer," and they have to be taught and coaxed into taking milk and milk puddings and meat. "Full" diet does not mean necessarily an identical ration for each patient. The first to be served with his dinner may be a hungry convalescent, who leaves not a trace of anything on his plate, and the next may be a delicate man with a small appetite, which is entirely taken away by the sight of a large plateful. Try also to humour the patient's fancy as to fat or lean, well or underdone, etc., and vary his diet as much as you can. But to

whomsoever the dinner is sent, see that it is nicely carved, put neatly on a hot plate, with salt, bread, and knife and fork, and see that the patient is able to help himself into a position to eat it, or else prop him up. Spread a "locker cloth" under his plate, to save the bed-clothes from grease, and give something to drink with each dinner. When a patient is very weak, and has little or no appetite, it is just the attention to these little things that gives him energy enough to eat; and a very little thing neglected will be excuse enough for eating nothing.

The hours for meals in hospitals are arranged by the authorities, and so wisely, as the result of many years' trials and experiments, that it is a good thing to keep strictly to them. Breakfast at six does seem early, but patients who object to it at first soon fall into the way of it, and a hot cup of tea and some food often induce sleep. We continually hear the night nurses say of a patient, "He had no sleep all night, but went off for an hour after breakfast," and we cannot help noticing what a large proportion of patients are asleep when the day nurses go on duty at eight. The last meal before bed-time should be a light one, so we give bread and butter and milk or broth at seven o'clock, a much better meal for an invalid than a heavy indigestible supper. A little food, such as a cup of hot milk or beef-tea, or even a bit of bread and butter or a couple of biscuits, will often send one to sleep after tossing restlessly for hours, and in the case of a sleepless patient it is always worth while to try this simple remedy.

Tea for a large number of persons is necessarily made in an urn, but it may be just as good as if made in a teapot if a little care is taken. Boil the water in the urn, no longer than just to bring it to the boil, add the tea and sugar, which should be tied in a bag, move the urn to a corner of the grate where it will not boil again, take out the tea-bag in six or seven minutes, and add the milk the last thing before pouring it out.

It has to be impressed on anyone that takes up nursing, that food for an invalid must be perfect of its kind, and served up daintily. Taste it before you take it to your patient, that you may be sure that the beef-tea has enough salt in it, and that the milk is not the least bit burned; but do not taste it in the poor

man's presence, nor with his spoon. It is a mistake to think that because our hospital patients come from poor homes, that they are the less keen to appreciate the way their meals are served. Do not spill anything into the saucer, and if the food is to be given hot, see that it is really hot. Most people think tepid things objectionable. When the patient has had enough, take away what is left, and do not leave it about for an hour or two to see if he will finish it presently. It is better to take him too little than too much; he had better want more than be disgusted with food altogether because he sees too great a quantity of it. If it is possible, avoid letting the patient see the preparation of any food; he may even take a simple thing like egg and milk better if he does not see and hear it being prepared. Never ask a patient with a bad appetite if he would like this or that, unless you have it close at hand ready to give him; if he has time to expect it and think about it, he may change his mind. Sometimes a patient's distaste for food means that he really has not the power to digest it, and it only makes him sick. Then leave him alone for a few hours, and see if rest to his stomach will do him good; or, if he is too ill to be left without nourishment for any length of time, give him very small quantities of fluid, such as a teaspoonful of milk or barley-water, frequently. Miss Nightingale says, in her "Notes on Nursing," that those persons who cannot take solid food in the morning, having a dry mouth after a restless, feverish night, can be kept going on a spoonful of milk or beef-tea every hour, until they feel well enough to take more solid things. And she says emphatically, "every patient, who can swallow at all, can swallow these things, *if he chooses*." We often come across patients who say that they cannot, and never could, drink milk. If the milk was in a medicine bottle, and two tablespoonfuls of it were measured out to them in a glass, they would find they could take it, and keep it down too. Not that this would be a good way of administering it, but if a person is perfectly ready to swallow any medicine, however nauseous, he can certainly take an equal quantity of milk, "if he chooses." This is where a good nurse's value comes in; she persuades her patient, in spite of himself, to take the necessary means for his

recovery. And the power of persuasion and the possession of much patience on the nurse's part will give her a great advantage over other women not so well endowed with these qualities.

When you are feeding a child, put the exact quantity you want him to take into the cup; never give him half of it and tell him he shall have the rest by-and-by. He will also be better pleased with a little glass quite full than with a big one that has only a little drink at the bottom of it. A glass feeder is a great convenience for very sick people, as it is almost impossible to see how much the patient is taking if you use an ordinary china one. A patient should not be wakened for food unless it is really necessary. Ask the doctor how long he may be left to sleep, and watch for the instant he rouses, and be ready with the food at once.

The doctor will, in all probability, order the diet to be given, but the nurse should know what is likely to be ordered, and should know what to feed a patient on until the doctor gives his orders. Any acute case with a high temperature would naturally be kept strictly to milk diet; indeed, it is the rule in the medical wards that a patient shall only have milk until the house-physician has seen him. And some patients, especially head cases and acute abdominal diseases. should be given only a spoonful or two of milk until they are dieted. Anyone with a long exhausting disease, such as phthisis and hip disease, will want as much nourishing food as he can digest. Give him eggs and plenty of milk in addition to full diet. Remember that beef-tea is more a stimulant than a food, and it must not take the place of more nourishing things. Jelly, also, has hardly any value as a food, but it is often readily taken, and is, after all, better than no food at all. Sick people often prefer savoury jelly to sweet.

When milk cannot be kept down, try giving it very cold, with a bit of ice in it, in small quantities; or put equal parts of soda-water with it, or barley-water, in the proportion of half the quantity of barley-water to the milk. If all these fail, peptonise the milk.

There are many ways of doing this. For example;—

Take One pint of milk,
Five ounces of boiling water,
One drachm of Pancreatic Solution,
Twenty grains of bicarbonate of soda.

Put it in an enamelled saucepan (a double one is best) near the fire, at a temperature of 140° for twenty minutes, then boil it up, and, as soon as it has reached boiling point, pour it off into a jug or basin, and stand it in a cold place. It ought to cool quickly, or it will get bitter.

There are many little variations in the way of preparing it. Some nurses divide the milk, boiling half of it, and mixing it with the other half cold, and not using any water; some use a larger proportion of the peptonising fluid, while some make it with peptonising powders instead of fluid. In whatever way it is made, it will have a peculiar taste, but it ought not to be bitter.

Milk and lime-water is also good in cases of sickness. Lime-water can be got at a chemist's, or it can be made at home thus. Take a lump of slaked lime, put it in a bottleful of water (distilled water is best), shake it up well, and then pour off the water carefully, so as to leave the undissolved lime at the bottom; and use it in the proportion of one part of lime-water to two parts of milk. You need not be afraid of putting too much lime in the mixture, as the water will only take up a certain quantity of lime, about half a grain to an ounce.

A patient on milk diet ought to take three pints a day. If he suffers from an acute disease, such as typhoid or diphtheria, we give it to him in small quantities frequently; quarter of a pint—*i.e.* five ounces—every two hours. If there is no need of feeding him so often, we divide the amount into half-pints, and give him half-a-pint at each meal in the day, and the same amount for a drink in the night. People get so tired of milk diet that it takes a good deal of trouble to persuade them to continue it. Try various ways of getting it down; one patient may prefer it boiled, another likes it iced, another with soda-water, another will hardly take it at all unless it is flavoured with tea or coffee.

Sometimes patients who are on milk diet only are allowed to take it once or twice a day as a blancmange made with isinglass (not with corn-flour). Or it may be given as a plain junket of curds and whey.

It is not necessary to give milk to a thirsty patient every time he asks for a drink. Keep to the usual rule of three pints a day, and let him have barley-water or lemonade to quench his thirst, or, what is better than anything, plain water. It very seldom happens that a patient is not allowed as much water as he likes to drink. There is a sort of superstition that cold water is bad for sick people, especially if they are feverish, and in consequence all the more thirsty. It scarcely ever happens that a doctor forbids it, except in the rare cases when patients are strictly limited in the amount of fluid they take, or after a serious operation, when we have to be most careful not to exceed the quantity of fluid that is ordered. It is cruelty to keep thirsty children without water, for milk does not quench the thirst as water does. But see that the patient takes his proper quantity of milk before you give him water or any other drink. Dropsical patients, suffering from kidney diseases, ought especially to be encouraged to drink—water, soda-water, tea, whatever you can persuade them to take. Hot water, but not tepid water, is also a good drink, and is said to relieve thirst more than cold water. Always boil water if there is the least suspicion of its quality. Boiled milk, too, is much more wholesome than raw milk, and is said to be more digestible; and it certainly keeps much better, because the boiling has destroyed the germs that turn the milk sour. But if the milk is kept in an open can, or in a warm or smelly place, more germs will enter, and it will soon be as sour as if it had never been boiled. The day's supply of milk for the ward should always be kept in the open air, covered from the dust.

Badly made beef-tea is as useless and disagreeable a food as can be given to a patient; but when well made, and carefully strained and flavoured, it is a great addition to his diet.

Take one pound of raw beef—the shin is generally used—

chop it rather small, put it into a clean saucepan with a pint of cold water and no salt. Let it simmer for several hours without ever letting it boil fast, and pour the liquid off the meat into a shallow basin to cool. When it is quite cold, skim off every particle of fat, and prepare it as your patient fancies it, flavoured with salt, pepper, or celery-seed, or Liebig's extract, or a spoonful or two of Moir's soups. Vary it if you can, and do not strain it unless it is to be given to a typhoid patient. We do not generally give beef-tea to patients with rheumatism, acute nephritis, and some other diseases, nor to patients with diarrhœa.

Meat juice is sometimes ordered for patients who cannot keep down ordinary food, or who are in want of a special stimulant. It is given to children in doses of one drachm once or twice a day; to adults in half-ounce doses every few hours. To make it, take one pound of minced raw beef, and one pint of water. Heat to 135 degrees. Stir it for fifteen minutes after heating, keep it at a temperature of 135 degrees to 140 degrees, but it must not once be allowed to get any higher. Cool it, add about three ounces of ordinary beef-tea, and a drachm of salt as flavouring. Strain it through muslin into a flask, cork it with a cotton-wool plug, and keep it in the ice box. Do not heat it before the patient takes it. The greatest care must be taken to keep it at the right temperature while cooking. A thermometer is necessary, for if the temperature of 140 degrees is exceeded, it will be simply the common beef-tea, as you will see by its colour being changed from red to the ordinary brown of beef-tea.

This is the best way of making it, but there are several other rough-and-ready methods. You may mince the meat in a machine, leave it with as much water as will cover it, with two or three drops of hydrochloric acid, for twelve hours in a cool place. Strain it before use. All the red colour should have left the meat by the time the juice is ready.

Or you can chop the meat small, and put it into a mug, with water enough to cover it, and stand it for a few minutes over the fire in a saucepan of hot, not boiling, water.

Or chop the meat, and put it between two plates, with a heavy weight on the top plate. This is not an effectual way, and it is wasteful; but the result is pure meat juice, without any water.

Sometimes raw meat pulp is ordered for children. A teaspoonful is enough for a dose. It should be sweetened with a little sugar before being administered. Take lean beef or mutton, cut it into small pieces, and reduce it to a pulp with a pestle and mortar. Press through a fine sieve, collect what is on the under surface of the sieve, and add it to what has come through.

Raw meat juice is objectionable to the eye, and is better given in a little ordinary beef-tea, or stirred up in milk. Or it might be given in a covered spoon.

Barley-water is made thus. Take two ounces of pearl barley, wash it thoroughly in cold water, and then add a pint and a half of water to the barley, and let it simmer in a saucepan for half-an-hour. Strain it before use. If it is to be given as a drink alone, it may be flavoured with a little lemon and sugar.

Albumen water is given in cases of persistent sickness, when everything else is brought up. It is made by taking the whites of two perfectly fresh eggs, and whipping them up thoroughly, carefully taking out all specks and stringy bits. Then add half-a-pint of water that has been boiled and cooled. It ought to be quite clear and tasteless. It is given iced, in small quantities frequently, to persons who vomit everything, and it may be given in much larger amount to patients who say they can take nothing but water. The albumen can hardly be distinguished in it, if it is well made. Of course it is not very nourishing, but it is better than no food at all.

In the same way the yolk of an egg can be added to a cup of coffee without the patient's knowledge. Free it thoroughly from the white, and beat it well into the coffee, which must not be scalding hot. You take away the white, because, if it is heated to the temperature of a hot cup of coffee, the albumen coagulates and becomes visible and solid, and the coffee looks and tastes nasty.

It is no use to try to "feed up" a patient with a high temperature. The digestive powers are so weakened by the fever, that the food does not get assimilated. Neither has the patient any appetite, as a rule, while the temperature remains high. Be content if he will take a sufficient quantity of milk. Nor should a dying person be disturbed by efforts at feeding him.

CHAPTER V

ARTIFICIAL FEEDING

ARTIFICIAL feeding has to be resorted to in those cases where the patient cannot, or will not, swallow, as well as in operations on the throat, stomach, or the upper part of the intestine.

When a patient is unconscious, it is still necessary that he should be fed. Rouse him as much as possible, press the spoon against his mouth, and just let his lips be wet with the milk, and he will often open his mouth involuntarily. Then put the spoon as far back into his mouth as you can, and give the food, a few drops at a time. Do not pour milk into a patient's mouth if he makes no attempt to swallow it, but lets it trickle down into his trachea. If you try to feed thoroughly unconscious patients in this way, the food will find its way into the lung instead of the stomach; and food in the lung will produce inflammation, and perhaps death. In this case, he may be fed by the nasal tube. Get ready for the doctor's use the long flexible tube kept for the purpose, or a soft catheter, which is often used instead, lengthened by a bit of ordinary rubber tubing, a basin of boiling water to soften the tube in, and a little glycerine in a saucer to smear it with, a small glass funnel to fit on the tube, and the required quantity of liquid food in some vessel with a lip to it. For a man, about a pint would be given at a time, most likely milk and beef-tea, and, perhaps, an egg beaten up in it. Of course it must be warmed. It is not likely that any nurse would have to pass a nasal tube without first having been shown by the doctor how to do it. The tube must be gently pushed in straight along the floor of the nose, not in an upward direction, for about fifteen inches for an adult. The great difficulty in feeding an unconscious patient in this way is, that the tube may pass into the trachea. If this has happened, it will set up violent

coughing, which will be enough to warn you that something is wrong; but if the patient is perfectly unconscious, you may feel some doubt as to where the tube is. Then notice if any air is drawn in and out through the tube, and if the breathing is altered, and, if you have any real misgivings, take the tube out, and satisfy yourself that you have really passed it into the right place before you pour down any food. Pour it in slowly at first, but keep the tube full all the time, and prevent any air from getting in by pinching the tube between each time of pouring, and then go on steadily until it is finished. If the child is likely to struggle, you may wrap him round in a big sheet, which will keep his arms tight to his side; but it will be much better to get an assistant to hold his hands.

Occasionally, it happens that a child has to be fed in this way, because he refuses to take any food, either because he is delirious, or from sheer naughtiness. It is a good plan, in this case, to put a small teaspoonful of salt into the food given, enough to make the child feel thirsty, and then he will most likely take it the next time without any trouble.

Sometimes a few inches of rubber tubing are fixed on the spout of a feeder, and the milk poured down at the back of the mouth; this must be done carefully, and breathing time must be given between each swallowing.

Sometimes the nozzle of a ball-syringe is passed between the teeth, and the ball is gently squeezed. Patients who swallow with difficulty can sometimes take their food better with their head hanging down low over a pillow, or over the edge of the bed.

When it is advisable that no food shall be given by the stomach, rectal feeding is necessary. This is generally ordered after abdominal operations, especially operations on the intestine, in cases of gastric ulcer, and of any obstruction to the alimentary canal, whether in the throat, stomach, or any other part which prevents food passing down in the natural way. Solid and liquid food may be given by the bowel. Solid food is given in the shape of a suppository, a cone-shaped mass of meat or milk extract. To administer it, turn the patient on his left side,

grease the suppository with vaseline, cover your first finger with a piece of lint, also smeared with vaseline, and push the suppository point upwards, as far up the bowel as your finger will reach. You will feel it slip from the end of your finger when it has been pushed up well inside the sphincter muscle which closes the rectum. Have a towel or a bit of cotton-wool at hand, and press a little against the anus to make sure that the suppository is not returned.

The other method of rectal feeding is by nutrient enemata; and a plan often adopted is to give a nutrient enema alternately with a suppository every four hours, so that three of each are given in twenty-four hours. The enema is best given in a ball-syringe, which will hold exactly the amount it is meant to administer, though a glass syringe is sometimes used, and, occasionally, a long tube connected with a vessel or funnel held up high, so that the fluid will trickle in very slowly. The object of a nutrient enema is, of course, to feed the patient; and if the food is not retained, it will do him more harm than good. To enable him to retain it, we give it very slowly, at the temperature of the body; and it must be composed of materials that will not irritate the bowel. Also the food must be partly digested, or peptonised, before it is given, as it will not pass through the stomach and the whole length of the intestine for the digestive fluids to act on it. For an adult, four ounces of fluid food is generally given at a time, and peptonised milk is the food most often used. But sometimes the yolk of an egg is added to it, and sometimes peptonised beef-tea is used. Half-an-ounce of brandy is occasionally ordered as an addition, and sometimes opium or other drugs. The brandy seems to irritate the bowel more than plain milk, and is less well retained in cases where the rectal feeding has to be continued for many days or weeks. Patients who are fed in this way often suffer much from thirst, which may be relieved by giving now and then half-a-pint of warm water, by a Higgenson's syringe, perhaps once or twice a day.

It is useless to try and feed a patient in this way whose bowel is loaded with fæces, so that, unless there has been an action recently, the first thing to do is to clear out the bowel with a

soap enema. Having prepared the enema, fill the syringe carefully up to the very tip of the nozzle, which must be oiled or greased with vaseline. Turn the patient on his left side, with his knees drawn up, standing yourself on his right; with your left fore-finger ascertain the position of the opening, and insert the nozzle very gently. You need never give any pain by doing this, and if the patient complains, there is reason to think that it is being done roughly. It is quite possible for the nozzle of the syringe to penetrate the mucous membrane lining the rectum; and if food or anything else got into the wound, an abscess would form, which would not only be acutely painful, but would retard recovery, if it did nothing worse. Empty the syringe as slowly as possible, by squeezing the ball, and never relax your grasp until after you have withdrawn the nozzle.

The following formula for nutrient enemata is taken from the Guy's Pharmacopœia:—

Take—The yolk of one egg,
Bicarbonate of sodium twenty grains,
Milk to four fluid ounces,
Pancreatic Solution two fluid drachms,
Common salt thirty grains.

Mix together the milk, egg, and bicarbonate of sodium; heat to 140 degrees F., add the liquor pancreaticus, leave the mixture to stand for three hours at the temperature of the room, or for half-an-hour at a temperature a little less than 140 degrees F.; heat for a minute to boiling point, add the salt, and inject at the temperature of 100 degrees F.

A variation of this is to use equal parts of milk and beef-tea instead of all milk. The quantity required for two or even three enemata can be made at the same time to save trouble, provided the mixture is kept in a cold place. Instead of Pancreatic Solution, five grains of Fairchild's Zymine (Extractum pancreatis) may be used, and one or other of the peptonising materials must be used for every nutrient enema, except that which consists only of brandy and water or port wine. Three or four ounces of hot port-wine as an injection is very useful in cases of collapse, especially after operations. Half-a-pint or more of

strong, hot, black coffee is used as a rectal injection in cases of opium poisoning.

A ball syringe is rather troublesome to keep clean and sweet. Wash it out well, every time you use it, with hot water and soda; take the nozzle off, and stand it up to drain until you want it again. When your patient is no longer using it, boil it in soda and water for a few minutes after thoroughly cleaning it.

It is unsafe to use a syringe with a loose nozzle, as it has been known to slip up into the bowel.

The nurse cannot be too careful, in giving an enema, to avoid injecting any air, which would cause pain, difficulty in administering it, and a great likelihood of the whole being returned.

Often after a long course of enemata, the bowel becomes intolerant, and can no longer retain the food. Then you must give the patient a rest for six or eight hours, and start again with a smaller quantity. There is often a great deal of soreness about the anus, which can be relieved by a little boric acid ointment or vaseline.

After the operation of gastrotomy, the patient is fed with fluids directly into the stomach. When the surgeon has finished the operation, he leaves a small indiarubber tube passed into stomach, through which the milk, beef-tea, etc., is poured in, by a glass funnel attached to the outer end of the tube. The doctor generally feeds the patient for the first time himself, that there may be no risk of the tube having slipped and the food finding its way into the abdominal cavity. Afterwards the patient is fed by the nurse three or four times a day. The skin in the neighbourhood of the wound is very apt to get sore, from the irritation of the gastric juice which escapes from the stomach, and sometimes the stomach is not able to retain the food, so that it regurgitates through the tube. It is altogether a difficult case to nurse satisfactorily.

CHAPTER VI

WASHING AND BATHS

THE average hospital patient has an idea that washing is rather injurious than beneficial for the sick, especially for himself. Some patients, if left to themselves, would wash their faces and hands as soon as they are allowed to get out of bed. Others would go a little further, and wash to that extent in bed, daily. But very few of them rise to the nurse's ideal of taking off their clothes and washing thoroughly to the waist, every morning, unless the nurse keeps a watchful eye on them, while she is going about her other work.

When the patient is too ill to do this for himself, he generally dislikes washing all the more, and it is a great opportunity for the nurse to exercise all her tact and skill. She must arrange the curtains and screen so that he will feel no draught, and must shut the windows if necessary; and bring hot water, and wash him so comfortably that he will rather look forward to it than not. Let him do all he can for himself, brush his hair, etc., and encourage him to use a tooth-brush, if he possesses one. If he is very weak, do not hurry over him, but give him a little breathing time between the various stages. When you have finished, there should be no room for an onlooker to doubt whether the patient's toilet has been made that day. This is a good time to bring food to anyone who eats badly, as he will feel refreshed and ready for it.

Besides the daily wash, there should be a weekly bath for every patient who is capable of it, and regular days for washing the heads and feet of those who cannot get out of bed.

When you are admitting a new patient, you have to consider whether a bath is permissible for him. It is impossible for accident patients to be bathed, as they are too collapsed after the shock of the accident to be able to bear it, even if there is no wound or fracture. A patient with a high temperature is better

washed in bed, and also one with any difficulty of breathing, unless it is a child so small that you can lift him and bathe him without any exertion on his part. A person with an open wound could not be bathed, nor any case of hæmorrhage, nor a patient with a rash, nor many kinds of skin disease. And we should never give a bath to anyone suffering from heart disease without getting express permission from the doctor; and if that *is* given, we should be careful as to the temperature of the bath, which should not exceed 95 degrees.

If there is the least doubt as to the infectiousness of a patient, or of his being afflicted with vermin, cleanse and carbolise the bath most carefully after use.

In preparing a bath, always use a thermometer, at least until your sense of touch is so educated that you can be sure of a temperature of 100 degrees without a thermometer. For an ordinary bath for cleansing purposes, 98 degrees is a good temperature—that is, the same heat as the body itself. Get the bath quite ready for the patient before he gets into it, and do not turn on more hot water while he is in it. For children you must be even more careful than for adults, for their skin is more delicate and can bear much less heat than the skin of a grown-up person. Do not put a child in water hot enough to make him cry, no matter how cool it may feel to your touch.

It is unwise, and in the hospital it is forbidden, to leave a patient alone in a bath; not even a convalescent patient may have a bath in a room alone. This is in case of accidents, which might easily happen from a patient fainting, or having a fit, while in the bath alone.

When the patient gets back to bed, see that his feet are warm: he may need a hot blanket and bottle; and if it is a first bath, remember that it is very likely he has not washed his head.

Persons with certain skin diseases sometimes have various medicinal substances added to an ordinary bath. A soda bath is prepared by adding about quarter-of-a-pound of bicarbonate of soda to a full-sized bath. An oatmeal bath is made by tying up loosely half-a-pound or more of oatmeal in a piece of muslin, and squeezing it out in the water until the water feels soft to the hand.

A good sized bag of oatmeal will soften the water for two or three baths. The oatmeal is not left loose in the bath, because it is likely to choke up the pipes.

A mustard bath is often used for a child with laryngitis (croup), and a foot bath with mustard in it is a popular remedy for a cold in the head. The Pharmacopœia orders one ounce of mustard to a gallon of water; this is a large proportion, and a child could only bear it for a short time. A mustard bath must, of course, be used as hot as it can be borne, and the patient should be kept in it till the skin is very slightly reddened.

A hot bath is given at a temperature of 100 degrees, or as much hotter as can be borne; a cold bath from 60 to 70 degrees, and tepid and warm baths between these temperatures.

If the hot bath is ordered by the doctor as part of the patient's treatment, as happens sometimes in Bright's disease, the temperature of the bath must be kept at exactly the height the doctor ordered it by the constant addition of more hot water. It is a good plan to keep the bath covered with a blanket to prevent its cooling too fast. Be accurate and quick in reading the bath thermometer, as it soon runs down when it is taken out of the water.

A patient who is too ill to step into the bath must be lifted into it on a sheet, the bath having been drawn up close to the edge of the bed. Leave a blanket only on him when he is lifted in, but hang it over the top, so that it does not get into the water. While one person watches the patient and his pulse, and attends to the temperature of the water, let another make the bed ready, preparing it with a long mackintosh over the lower sheet, and putting a blanket to warm by the fire. Leave the patient in the bath for twenty minutes, but if his pulse gets weak, or he complains of faintness, put him back to bed at once. Lift him, sheet, blanket, and all, on to the mackintosh. Roll him on his side to remove the wet sheet, rub him down quickly with a hot towel, underneath the original blanket, and then put on him a warm flannel shirt, and roll him in the hot blanket, taking away the mackintosh at the same time. If the bath has been given to promote perspiration, take all the means you can to make it

effectual, by giving hot drinks freely, and putting hot bottles in the bed.

The uses of a hot bath are various; it is given to relieve pain in renal colic; to soothe excitement in chorea and delirium; to relieve difficulty with urine in cases of retention; to promote perspiration in uræmia; and in many other cases, such as infantile convulsions.

A cold bath is given in cases of hyperpyrexia, or high fever, which occurs occasionally in typhoid, rheumatism, pneumonia, etc. It is not used in typhoid cases if there is hæmorrhage or bad bronchitis.

The patient is always so ill when the bath is ordered that you may take it for granted that the doctor will be present to give directions. The patient is not lowered directly into cold water, which might cause a fatal shock to a weak heart, but the bath must be prepared with tepid water, and after the patient is placed in it, it is cooled down with cold water and lumps of ice, say from 85 to 60 or 65 degrees. It takes a great quantity of ice to cool it, as, if the patient's temperature is 105 degrees or higher, he heats the water for some time as fast as the ice cools it.

Have brandy close at hand, both in a glass with water and in a hypodermic syringe. The pulse will be felt continually, and the temperature must be taken in the rectum at short intervals. A draw-sheet is quite enough for a covering, as the patient will perhaps be rubbed down with lumps of ice. He will be put back to bed if he begins to shiver. Do not then heap blankets upon him, but leave him with a sheet only, and a thin shirt, and a blanket just across his feet. Take his temperature several times during the next two or three hours, as it is likely to fall for some time after the bath is over.

To give a hot-air bath a special apparatus is necessary. A metal pipe is connected with a sort of inverted funnel, under which a spirit-lamp with several wicks is lighted, and this pipe is introduced at the foot of the bed, so that the hot air from the lamp passes up the pipe into the bed.

The patient must be prepared by taking off his clothing and wrapping him in a hot blanket, rolling a long mackintosh in the

bed under him. Then put two cradles over him—wicker ones, not metal, which would get too hot,—cover them with another long mackintosh and two or three more blankets, tucking them in all round carefully. Notice especially that the blankets must not touch the hot-air pipe, or they will be scorched. Be careful that the patient's feet are well protected by a blanket. It is necessary to take special precautions that he shall not be burnt; for the patient most likely to have a hot-air bath would be one suffering from Bright's disease, in which the skin is easily affected and inflamed, and not easily healed again. The patient may also be unconscious or half-conscious from being in a uræmic condition, and would therefore be less likely to give warning of the pain of the burn than a man with a clear head. Never neglect any complaint of pain; some patients will bear a good deal, thinking that it is a part of the treatment, and then you may find a burn that takes a long time to heal up.

In the absence of special orders, the usual length of a hot-air bath is twenty minutes. At the end of the time put out the lamp, take away the hot-air pipe, and slip out the cradles and mackintoshes at the foot of the bed, and leave the patient lying between the blankets till he has done sweating, perhaps for a couple of hours. Give him plenty of warm drinks, and watch that he is well covered up, until it is time to put on a warm shirt and make the bed again.

A vapour bath in bed is managed in the same way, except that the steam from boiling water is introduced into the bed instead of dry hot air. See that the water boils when you put it into the apparatus, and do not more than half fill it. The bed-clothes get much more damp with a vapour bath than with a hot-air bath, or, at least, they will do so if you are not very careful with the mackintoshes.

Do not use the best blankets for any of these baths: if there are no rugs kept on purpose, use the oldest blankets you have.

A calomel bath has to be given with a special little lamp made for the purpose. The required amount of calomel, about fifteen grains usually, is put into the little tin saucer on the top of the lamp, and the groove around it is filled with water. Put a cradle

over the patient, whose clothing must be removed, and cover the cradle with several blankets. Light the lamp, and put it in the middle of the bed under the cradle. It requires some management to keep the lamp burning under the bed-clothes without letting in too much air to chill the atmosphere; and it takes much care to prevent the bed-clothes being set on fire, or the patient being burnt. If none of these accidents happen, the calomel will have evaporated and have been deposited on the patient's skin in about a quarter of an hour. Then take away the lamp, and leave the patient just as he is for a little while, without rubbing him down or putting on his shirt.

A patient must never be left alone in any of these baths; it is so easy for accidents to happen with spirit-lamps, which might be fatal if no one was at hand.

Calomel given in a bath, as well as in any other way, may produce mercurial poisoning, and the nurse must be on the look-out for symptoms of it—sore gums, foul breath, diarrhœa, etc.

CHAPTER VII

HOT AND COLD PACKS, ETC.

A HOT pack is used for much the same purposes as a hot bath, but it is more practicable than a bath for an unconscious patient, and it is easier for a nurse to manage single-handed.

Prepare the bed by rolling in a long mackintosh with a hot blanket over it. Remove the patient's clothes. Take a large sheet, roll it up lengthways, and double it over two or three times, and wring it out in boiling water, using a draw-sheet or a very large towel as a wringer. Turn the patient on his side in the bed, lay the hot sheet, half-unrolled, alongside of him, and roll him back into it as hot as it can be borne; then unroll the other half of the sheet and cover him with it, and turn up the sides of the blanket he is lying on, so that he is rolled in the hot sheet first, with the blanket over it. It has to be done very quickly, as the sheet cools directly. Then lay another long mackintosh over him, and cover him up with plenty of blankets. If you want to promote perspiration, always give hot drinks, and, in cold weather, put two or three hot bottles in the bed. See that the windows are shut, or put screens round the bed. Let him remain in the pack for about twenty minutes, and then take away the wet sheet, and blanket, and mackintosh, replacing them as quickly as possible by a hot dry blanket. A patient will often sleep for hours after a pack, so it is better to give it in the evening, as then he need not take his arms out of the blankets for meals, etc.

A patient is prepared in much the same way for a pilocarpine injection, which is also intended to make the skin act; but there will be no need to use mackintoshes. Pilocarpine sometimes causes faintness, and the nurse should have half-an-ounce of brandy in readiness at the time the injection is given.

A cold pack is given for an entirely different purpose from a

hot one—namely, to reduce temperature; and it must be managed in quite a different way.

Wrap the patient in a sheet wrung out of cold, or iced water, and cover him with another sheet only, which may be put on over a cradle. The sheet must be kept cold by being rubbed down with pieces of ice, or by being constantly wetted with cold water. The temperature must be taken every five minutes, and the pulse watched; look also for any appearance of shivering, and have stimulants at hand. The temperature may continue falling after the cold is discontinued, but the length of time the pack lasts depends on its effect on the temperature.

If, after a cold pack has been ordered, the patient begins to perspire, do not carry out the order until you have let the doctor know what has happened, as it would do harm to check the perspiration.

Although cold applications may cause shock and faintness, yet cold itself often acts as a stimulant, as in the case of a new-born baby who does not breathe as it should, or a person who is fainting, or one who is not recovering from an anæsthetic. Dashing cold water on the patient, or flicking him with a cold wet towel, will often bring him round.

Ice-bags are used to reduce outward inflammation, and sometimes in cases of inflammation of the brain, lungs, etc. They are used in cases of irreducible hernia to contract the parts affected and thus to make reduction possible. They are applied also in internal hæmorrhage; if it is from the lung, the ice-bag is put on the chest; if in cases of typhoid, on the right side of the abdomen, and if from the stomach, it is laid on the epigastrium. An ice-bag may also deaden the pain of pleurisy, if it is laid on the affected side, and it often relieves headache.

In filling an ice-bag, we should remember that it will adapt itself much better to the head, limb, etc., if it is only half-full. An ice-pick is a wasteful implement for cracking ice, a glass headed pin is much better. When you apply an ice-bag, unless it is on the head, protect the skin with a piece of lint; and do not let the whole weight of the bag rest on the patient, but hang it from the bed top or from a cradle beneath the bed-clothes.

An ice-bag will need refilling at least every two hours in the winter, and oftener in the summer; for an alternation of ice and a bag full of warm water will do no good where a steady application of cold has been ordered.

A more troublesome way of applying ice is in an ice poultice. This must be renewed every hour and a half, for it holds less ice than a bag holds, and as it is more closely adapted to the body, it melts sooner.

The materials for making an ice poultice are: gutta-percha tissue, chloroform, ice, salt, and either linseed meal or wood-wool, the latter being preferable, as it is more absorbent, cleaner, and lighter than linseed meal.

Take a doubled piece of gutta-percha tissue, an inch or two larger than the poultice is to be. Sprinkle on the lower leaf of the tissue a thin layer of wood-wool, place on it crushed ice, sprinkle the ice with common salt, and put on the top another layer of wood-wool. Turn down the upper leaf over it, and fasten it securely to the lower leaf with chloroform. When the bag has been used, you can cut off one joined edge, and empty it and use it again; if it is used carefully it can be refilled several times, as the tissue is rather expensive. It is also possible to use the wood-wool several times over, if necessary, by drying it thoroughly in an oven. You may put the poultice in a flannel bag, but a thin piece of lint to protect the skin does as well. Ice poultices are used to relieve pain in pleurisy and pneumonia, to relieve inflammation, as in quinsy, and to reduce temperature generally.

Another common way of reducing temperature is by sponging. A patient who needs sponging is generally very ill, and must have his strength saved as much as possible. Take off his shirt, leaving him with only a sheet over him. Be careful of draughts while he is uncovered, or bronchitis may be added to his other maladies. Use as large a sponge as you can get, and water of the temperature that has been ordered. Some doctors like iced water to be used, in which case it is better to begin with tepid water, cooling it down from time to time with lumps of ice. Sometimes quite hot water is ordered, at 115

degrees, which the patient will probably dislike much less than cold sponging. The sponging should last twenty minutes. Begin with the face, then sponge the chest, arms, and abdomen, then the legs; then roll him on his side, and sponge down his back. Do it in long steady strokes, and not in short unexpected pats, which only worry the patient. Dry him gently, put on him a dry shirt, and see that his feet are warm, and leave him with only a light covering on the bed. Take the temperature again in half-an-hour's time. If you have done the sponging properly, his bed will not have been wetted. The sponging should be stopped before the end of the twenty minutes if it brings on a real attack of shivering.

The patient will most likely strongly disapprove of any sort of cold baths or sponging, and should have it made as pleasant as possible for him under the circumstances. See that you do not expose him more than is necessary; do not let him catch cold; do not talk to him; and, above all, do not worry him while you are carrying out your orders.

Cold evaporating lotions are used on inflamed surfaces, as in cellulitis; and should be applied by soaking a single piece of lint in a porringer of iced lotion, which is to be laid on the affected part without any covering of cotton-wool, gutta-percha tissue or bandage. Keep another piece of lint soaking in the lotion, and change it as soon as the first piece ceases to feel cold; or else drip the lotion on the lint without removing it, so as to keep it thoroughly cold and damp. Spirit lotion or eau de cologne applied to the forehead in this way often relieves a headache.

Ice can be used to stop bleeding. A piece wrapped in lint and applied to a leech-bite is sometimes effectual, and small pieces of ice put up the nostril may stop bleeding from the nose—"epistaxis."

Such applications as lead and opium lotion, which are deadening to pain in themselves, are more effectual if put on hot, and covered up with tissue and wool.

Poultices (cataplasms) are less used than formerly. For chest cases their place is often supplied by hot dry cotton-wool, or Gamgee tissue made into a jacket shape; and, surgically, hot

fomentations, plain or medicated, and dry dressings, are used instead. But a hot poultice is very effectual in relieving pain, and this is its most frequent use. The careful nurse, therefore, does not put the poultice on so hot as to *cause* pain, to say nothing of blisters. The patient knows when he is being hurt even better than the nurse does, and she must bear in mind that repeated applications of moist heat make the skin very tender and liable to blister. Be very careful in applying a poultice to the thin, sensitive skin of a child, or to a paralysed patient whose generally lowered condition cannot bear any extremes of heat or cold. But, on the other hand, when hot fomentations are being constantly applied for colic or other violent pain, they lose their effect of deadening the pain before the patient will allow that they are too hot for him to bear.

After a mustard poultice has been applied, the skin is tender and inflamed, and can only bear a very mild degree of heat. Vaseline is soothing to a skin reddened by mustard, and it lessens the pain of the succeeding linseed poultices. In changing poultices, always have the new one ready to put on the instant the old one is taken off. Do not change it just a few minutes before the doctor is expected to examine the affected part. Try to arrange the poultice so that it shall stay where it is expected to be; it is very apt to slip from the chest of a bronchitic patient who has to sit up in bed, unless it is fixed firmly by a many-tailed bandage or a piece of old linen or flannel which can be fastened with three or four safety-pins. A flannel bandage is much the best; a strip of calico, lined with flannel, about fourteen inches wide and a yard long, makes an excellent abdominal bandage for keeping poultices, etc., in place; and a piece a good deal wider, provided with tapes to tie above each shoulder, will keep a chest poultice from slipping. A rather tight vest also answers pretty well for this last purpose, but it is awkward to get over the head.

For making poultices, crushed linseed is the best meal to use. The oil has not been extracted from the meal, so that it retains the heat longer. What is called linseed meal at a druggist's is fine dark-coloured stuff, very different from hospital linseed meal.

When you have to make a poultice, first put on the kettle to

boil, and if the weather is cold, put everything you are going to use by the fire for a few minutes. Get a basin, a knife or spatula, linseed meal, and either tow or old linen, or, if for a baby, a thin layer of cotton-wool. If you use tow, it must be pulled out—teazed out—thinly to the right size and shape, without leaving any lumps in it; and if it is not pulled out in the right way, the poultice will not hold together. Rinse out the basin with boiling water, and pour as much boiling water as you want into the basin. Only experience will tell you how much you want. Sprinkle the linseed into the water with one hand, stirring it quickly all the time with the spatula, until it is of the exact consistence it ought to be; not dry and crumbly, nor sloppy, nor lumpy, but smooth and just firm enough to spread easily. Turn it out in a mass on to the tow, and spread it all over the surface with the spatula, which should be dipped occasionally into boiling water to keep it from sticking. If the poultice is for the chest or abdomen it must not be very thick, for a man whose breathing is difficult, or one who has severe abdominal pain, will not appreciate the weight of a pound or more of linseed. The test of a good poultice is that it shall come clean off without breaking or sticking to the skin. Some people recommend that the poultice should be put inside a flannel bag, with the object of giving a steady, long-continued heat.

A mustard poultice is made in the same way as a linseed one, but with the addition of mustard. The Guy's Pharmacopœia directs the use of one part of mustard to sixteen of linseed, and one finds in practice that one part in seven or eight is as hot as most people can bear it. The mustard and linseed may be mixed dry, or the mustard may be made separately with warm, not hot, water, and added after the linseed is mixed up.

A mustard plaster is sometimes made by spreading made mustard on a piece of brown paper, but mustard leaves are much cleaner and pleasanter to apply. The leaf is dipped in tepid water, and a piece of soft rag, such as two or three folds of an old handkerchief, is placed between it and the skin. Leave it, if it can be borne, till the skin is well reddened, but not long enough to produce a blister.

Never leave any poultice, fomentation, or mustard leaf to slip about the patient as he moves; always fix it in plaee with some kind of bandage.

A jacket-poultiee is sometimes ordered for patients with bronchitis. It is made in two pieces, for the ehest and back, and it must eome up in front well over the eollar-bone, and there must not be a large vacant space left under the arm. Every four hours will be often enough to change it. For a baby it should be made on lint or linen, and should be eovered with gauze or thin muslin to avoid burning the ehild. It must be changed oftener than for an adult. A restless patient must also have his poultiee often renewed.

Poultices for the throat must come well up to the ears, and are kept in plaee by a bandage passing over the top of the head. They are used for quinsy, as they give great relief to the pain in the throat; but there is no need to eontinue them after the abscess has burst, it is enough to replaee them by a pieee of cotton-wool. It is generally advisable to put cotton-wool for a little while on any part that has been poulticed.

A fomentation is used, like a poultice, to relieve the pain and swelling of inflammation, and any other pain. To prepare it, first boil the water or lotion that is to be used. Get two pieces of old blanket, or of lint and tissue if only a small pieee is wanted; a bandage, one or two safety-pins, and a wringer. This is a pieee of stout linen, such as round towels are made of, with a wide hem at each end, through whieh two strong sticks ean be passed. Put the flannel inside the wringer, and pour the boiling water or lotion on it, and twist the stieks of the wringer round and round till the flannel is as dry as possible. Carry it in the wringer to the bedside, take it out and give it one shake, and apply it as hot as the patient ean bear it, cover it with the dry flannel, and fix it in plaee with a bandage. A fomentation should be ehanged every two hours, unless it is for the relief of great pain or of throat symptoms, when it must be changed every few minutes. If a drachm or two of turpentine is sprinkled on the flannel, it is called a turpentine stupe. This is not used for ehildren. Sometimes laudanum is used on fomentations, and the quantity ordered

is generally from half-a-drachm to a drachm, which should be carefully measured. If any liniment, such as glycerin of belladonna, is ordered with a poultice or fomentation, smear the skin first, very gently, with the liniment, before putting on the poultice.

Poppyhead fomentations give great relief in many aches, especially toothache and faceache. Tie two poppyheads in a piece of muslin, break them up and boil them in two pints of water for half-an-hour or more, and use it in wringing out the fomentation in place of plain water.

For boric acid, and lead and opium fomentations, the lotion must be heated in a saucepan kept for the purpose. A double one is best, such as is used for boiling milk, as there is then no risk of burning it. Do not add a little boiling water to the lotion and think it strong enough and hot enough for the purpose; the lotion must be used as it comes up from the dispensary. But for bathing the eyes boric acid lotion with an equal part of hot water is used.

Hot-water-bottles are indispensable in nursing. They are made of indiarubber, tin or other metal, and earthenware. Those made of tin have various drawbacks, as they rust the bed-clothes, and often leak. The indiarubber bags adapt themselves to the shape of the body, but they are rather expensive, and have to be used carefully; and they do not keep hot nearly so long as the earthenware. Whichever sort is used, it must always be put into a flannel bag, and the top tightly fitted and well screwed in. If the patient is under the influence of chloroform, or unconscious from any cause, be most careful that the bottle does not touch him, and that there is at least a blanket between him and the bottle in its bag. Watch him, lest he should move and disarrange the hot bottles, for if they press on a patient, even a moderate amount of heat seems to produce a sore.

Bricks made hot in an oven can be used for warmth, if they are well wrapped up in flannel. Hot dry flannels, or pieces of cotton-wool, give great relief in pain, but they are no use unless they are made very hot. In cases of collapse, as after chloroform, after an accident, or in heart failure, a really hot blanket is a capital restorative.

Heat is applied to the throat and lungs in the shape of steam. The simplest way to apply steam is by means of an inhaler, a covered jug with an opening at one side to let air in, and another opening at the top with a glass mouthpiece to it, through which the patient breathes the hot vapour. An ordinary teapot answers the purpose pretty well. About a pint of boiling water is put into the inhaler, and something is generally added to it to medicate the vapour, such as a drachm of compound tincture of benzoin, or a few minims of creosote. These things are disinfectants, and are used to sweeten the air passages and remove the cause of the foul breath which makes some cases of lung disease so unpleasant for the nurse, and even for the patient himself. Siegel's steam spray is used for the same purpose, with formalin or other disinfectant in it; it is used with morphine, etc., for the relief of cough, and with bicarbonate of soda to help to dissolve the membrane and sticky mucus in diphtheria. There are also various little hand-sprays which apply cold vapour containing cocaine and other remedies to the throat.

Hot inhalations are never to be used in cases where hæmoptysis has come on, unless you have clear and special orders about it.

When the breath and sputum are peculiarly foul, as in cases of bronchiectasis, the patient may be enclosed by means of curtains and screens, with a covering thrown over the top, and caused to breathe air strongly impregnated with creosote for an hour or so twice a day. The creosote is added to half a pint of water, which is kept boiling in a shallow open tin, over a small spirit lamp, which stands at the side of the bed, inside the screens. It is best to do this for a child while he is asleep.

CHAPTER VIII

BLISTERS, ETC.

IN applying any sort of liniment or lotion, such as blistering fluid or collodion, the required amount should be poured into a little saucer, that the brush need not be dipped into the common bottle. A blister is generally ordered as a counter-irritant, for the relief of pain. It is produced by some preparation of Cantharides, or Spanish flies. These are not really flies, but beetles, about an inch long, which are found in Hungary. The blistering fluid (liquor epispasticus) is prepared with acetic ether; the plaster (emplastrum cantharidis, or emp. lyttæ) is mixed with wax and resin, and spread on linen.

The skin must be washed before either of these is applied, in order to remove its natural oiliness. Warm the plaster a little, put it on the place on which it is intended to raise a blister, cover it with absorbent wool, and fix it with two bits of strapping or a bandage. Be careful that it does not slip, for a blister in the wrong place will hurt the patient without benefiting him. Occasionally a flying blister is ordered—*i.e.* a plaster kept on long enough to redden the skin without actually raising a blister.

When the object of the blister is to remove a large amount of fluid, a poultice is substituted for the plaster as soon as the blister begins to rise.

To apply the blistering fluid, draw a circle of olive oil round the part you mean to blister, to prevent the fluid from running too far, and then paint it on with a camel's hair brush. Let the blistering fluid dry, and then paint it on again, five or six times, until it begins to smart a little. Cover the place with a bit of gutta-percha tissue, cut to the size of the blister, and fix it with cotton-wool and a bandage.

The time it takes to rise varies very much; there may be

a pretty large bleb in three hours, or it may take a whole day. If it does not rise in a reasonable time apply a linseed poultice over it, and if this is not effectual, paint the place again with blistering fluid. When it has risen well, unless contrary orders have been given, it must be snipped in several places with a a pair of clean scissors, holding a test tube or dish to catch the fluid if it has to be saved. It is said that if the fluid from a blister is allowed to run over the adjoining skin, it will raise another blister.

Dress the sore place with lint spread with boric acid ointment. It will very likely form another bleb in two or three hours, which will have to be snipped again; at anyrate, it should be dressed twice in the first twenty-four hours, and then once a day for two or three days, after which it will only need a a piece of dry lint to prevent its being rubbed.

Sometimes the contents of the blister, instead of being fluid, consist of a sort of jelly which will not run out when it is snipped, but gradually gets absorbed in a few days. Now and then a blister has to be kept open, which is done by its being dressed with savin ointment (Ung. Sabinæ B.P. 1885), which must be re-applied every day as long as it is to be kept open.

The place for a blister to be applied is generally marked out on the skin; but if it is not marked the rule is, never to put it exactly over a bone. A blister for the knee is cut into the shape of a horse-shoe, and avoids the knee-cap, being put on with the two ends pointing to the foot. A blister to the spine is applied to one side of it, or else it is cut in two, and a half is put on each side. A blister is often ordered to the right or left base (of the lung), and is then put on the back of the chest, below the angle of the scapula. A blister over the heart should avoid the nipple. A very large one may be painted on in three or four strips, in a sort of gridiron pattern, as the resulting sores heal up more quickly than one large sore. A blister for the eye is put on the temple, about an inch from the eye; and for the relief of headache one is put on behind each ear.

Another counter-irritant is a seton. It is an occasional remedy, used at the back of the head for persistent headache, and in the skin of the temple for some affections of the eye. It consists of a piece of coarse silk, drawn through the skin by a large needle, and the two ends tied together to prevent its coming out. It has to be kept carefully clean, and the silk must be drawn through once a day to keep the wound open.

Occasionally an irritating ointment is rubbed into the skin to produce a pustular eruption. Croton oil and antimony ointment are both used in this way. Of course, the fingers must not be used in rubbing. The nurse must be careful of her fingers in rubbing in any sort of ointment or lotion, especially if it contains any powerful drug, such as mercury or belladonna; she should use a piece of lint to rub with, and should wash her hands directly afterwards.

Iodine liniments, and some others, make the skin very sore after two or three applications, and must then be discontinued for a few days until the soreness has gone off.

Camphorated oil (Lin. camphoræ) well rubbed into the front and back of the chest, is a popular remedy for a bad cold or an attack of bronchitis.

Belladonna and glycerin is much used over enlarged and painful glands to promote absorption. It is used for the breasts of women who are obliged suddenly to leave off nursing their babies. Soak a large piece of lint thoroughly in the liniment, cut a hole in it for the nipple, cover it all well in with cotton wool, and bandage it on firmly. The bandage will need to be re-applied two or three times a day, as it soon gets out of place.

Leeches (hirudo, a leech) are used for removing blood from various parts of the body, thus checking inflammation and relieving pain. They are small green-and-black creatures, very like garden slugs, found in ponds and rivers. They are kept for use in jars of water, which water has to be changed every few days. It is well to remember that the less a leech is handled before it is used, the more likely it is to bite.

The skin must be thoroughly washed, as the leech will not bite a dirty skin, nor one that has any strapping marks or liniment left on it, or any kind of lotion. The materials you want are cotton-wool, and strapping or bandage, little bits of lint about the size of a sixpence, tincture of benzoin, and a porringer of strong salt and water. If there is no exact spot marked out to put the leeches on—*i.e.* if they are only ordered "to the epigastrium," or "over the liver," take the lid off the box they are in, and turn the box down on the patient's skin, and in a minute or two you will find them all hanging on. But if the leech is ordered to some special spot, put a bit of cotton wool half-way down a test tube, put the leech into the remaining space, and apply it to the exact spot. If it will not bite put a drop of milk on the skin, and it will most likely begin.

A child must never be left alone with a leech on him, for children are always afraid of them; nor, indeed, is it wise to leave any helpless or nervous patient with them on. If half-a-dozen leeches are applied to the body, it is sure to be an exhausting operation for the patient, as he has to sit in one position without moving for half-an-hour or more, and he is, moreover, most likely in a breathless, panting condition to begin with; so watch him, and if he is getting exhausted, take them off with a bit of salt on their tails before they are quite ready to drop off of their own accord. Never pull a leech off, as it may leave its sharp little teeth in the wound, which might cause inflammation, or even an abscess.

A leech takes up more than its own weight of blood—it is reckoned as from one to two drachms; but besides this, there is always a certain amount of bleeding from the wound. Watch for the leeches to drop off, and kill them by putting them into salt and water. If they are left to their own devices, they will crawl away into some corner to digest their meal. Then stop the bleeding, unless you have special orders to the contrary. If it has to continue, a hot poultice is put on; if not, the best dressing is a tiny bit of absorbent wool dipped in tincture of benzoin, for each bite, and then a covering of

a large pad of cotton-wool, whieh must be fixed on firmly with strapping, or a bandage. It is easy enough to stop the bleeding from a leech-bite if it is over a bone, as on the head, where you ean get firm pressure; but about the body, where you eannot bandage tightly enough without distressing the patient, it is difficult to stop. If one remedy is not effectual, try another; but do not heap lint and bandage over the soaked dressing; take it all off, and start fresh from the beginning. Perhaps collodion may stop it, or tannic acid, or perchloride of iron, or a lump of ice; these are all styptics; but if everything fails, the steady pressure of a finger for ten or fifteen minutes is always suceessful.

Do not forget to watch the patient after the dressing has been put on, or he may lose a pint of blood before he discovers it for himself; and be eareful not to disturb the dressing for a couple of days, as the bites will very likely start bleeding again if they are interfered with.

Leeches relieve headache, for which they are applied behind the ear. When they are used about the rectum or vagina, they must be secured by having a thread run through their tails. It is difficult to distinguish between a leech's head and tail, until it is actually biting.

A leech must never be put on over a vein.

Cupping is performed in two ways, known, respectively, as wet and dry cupping, the former being seldom used. The object of it is to remove blood from an inflamed part, and to relieve pain. Cupping is often used for persons suffering from acute nephritis, in which case the cupping-glasses are applied over the loins. Four or six glasses are generally used. They are about the size and shape of the bowl of a wine-glass. The nurse must also provide a saucer of methylated spirit, and a few bits of blotting-paper an inch or two square. The blotting-paper is erumpled up, dipped in the spirit, put into the cupping-glass, and lighted, and the glass is turned over immediately, before its edges have had time to get hot, on the patient's skin. If it is properly done, the portion of skin eovered by the glass will

rise up inside it in the shape of half a globe, and the glass will adhere closely to the skin. When all are put on, they are left for about a quarter of an hour, if the pain can be borne so long, and are then removed by means of the finger nail, which is inserted under the edge of the glass. The nurse then applies a hot poultice for a few hours, after which nothing is needed but a piece of cotton-wool to protect the skin. This is dry cupping. In wet cupping, small cuts are made through the skin with a cupping-knife, and then the glasses are applied as before, and are allowed to stay on till the requisite amount of blood has been removed. The places are then dressed with dry gauze or ointment, or any other suitable dressing, and a hot poultice is not applied unless it is desired that the bleeding should continue.

Venesection, or bleeding, is the cutting open of a vein to let out blood. The nurse prepares for the doctor's use a mackintosh, disinfectant lotion, a measure-bowl (bleeding-bowl was its old name, when venesection was a daily occurrence), cotton-wool, lint, bandage, and something to put on the wound, such as collodion and gauze, or tincture of benzoin. She must also have at hand a dose of some stimulant in case of faintness, either half-an-ounce of brandy in a little water, or an ounce of ammonia mixture. Bleeding is almost always done in the arm, from one of the veins at the bend of the elbow, where it is easy to control. When the bandage is put on, raise the arm on a pillow if it can be borne. If the vein should start bleeding again, get someone to hold the arm high above the patient's head, while you remove the soaked dressing and put on a fresh one. Then keep the arm high up by means of pillows, or sling it up with a bandage to the bed-top. Watch it carefully, in any case, and do not let the patient lose more blood than he has lost already.

Watch any place where there has been bleeding, whether it it is an amputated thigh or a leech bite.

Transfusion is the exact opposite of venesection, as the operation consists of injecting fluid into a vein instead of withdrawing

it. The fluid injected is salt and water, in the proportion of one drachm of salt to one pint of boiled water, which has been cooled down to a temperature of about 105 degrees. This is rather hot, but the water will certainly lose some of its heat in passing through the syringe and tube that is used. From three to five pints are injected. Transfusion is performed in cases that have lost much blood during operation, and when much fluid has been lost from the body in any way, as in severe choleraic diarrhœa. It is also used in cases of diabetic coma.

A nurse should know what to do in cases of sudden hæmorrhage before a doctor can arrive. If the bleeding is from an external wound, the knowledge of the position of the main arteries will enable her to compress the artery, and check the hæmorrhage until help comes. This knowledge has saved life many times. If the bleeding is from a limb, the limb should also be raised. If the bleeding is from the lungs, it is called hæmoptysis. When the patient is in imminent danger of choking, from his mouth and nose being filled with blood, the nurse must try to clear out the clots, and empty the air passages by hanging his head over the edge of the bed, or by taking away all the pillows, and lifting the foot of the bed on a chair, or by some other means, so that the patient's feet shall be a good deal higher than his head. When the immediate attack is over, he must be kept as quiet as possible, and must not be allowed to talk, nor to have more than one small pillow under his head. Small pieces of ice to suck will be allowed, but nothing else for an hour or two. A rather dry diet is generally ordered after an attack of hæmoptysis. The patient's bowels are kept rather loose by means of aperients or enemata, as straining is very likely to bring on the bleeding again.

When the blood is not coughed up from the lung, but vomited up, it is called hæmatemesis. The blood is generally darker and thicker than the frothy blood that comes from the lung, and it may contain food or mucus mixed with it. People scarcely ever die during the attack of hæmatemesis, though it is very alarming,

and is often difficult to distinguish from hæmoptysis. The immediate treatment is to keep the patient quiet, and to give nothing whatever by mouth. Brandy is on no account to be given in cases of hæmorrhage, except with doctor's orders, or when the patient is evidently at his last gasp.

Bleeding from the nose is called epistaxis. It generally stops of itself, if the patient is made to lie down, and is not allowed to hang his head over a basin. If it still goes on, ice can be applied to the bridge of the nose, or small pieces of ice may be put up the nostril, and sometimes plugging the nostril from outside suffices to stop it, though often the blood then trickles down the back of the nose into the throat. It is always worth while to try pinching the nose, as sometimes the bleeding is from the front of the nose.

When the hæmorrhage is from the rectum, the patient must be kept quite flat and quiet in bed.

In cases of vaginal hæmorrhage, the patient must have the pelvis raised on a firm pillow. Sometimes injections of hot water, at 115 degrees, or as much hotter as can be borne, will stop the flow of blood. Plugging the vagina is occasionally necessary.

After a severe hæmorrhage of any kind, it is of some use to bandage firmly both the arms and legs, beginning at the fingers, and going quite up to the shoulders, as this proceeding tends to keep the blood circulating in the vital parts of the body.

In any sort of hæmorrhage, hot drinks are to be avoided; the extremities must be kept warm, the head kept low, and stimulants only given by direct orders.

For washing out a stomach, prepare for the doctor's use a long indiarubber stomach-tube, with a glass funnel attached, and glycerin to smear on the tube; two large empty basins, a pint-glass measure, a jug of water at the temperature of 100 degrees. Pin a mackintosh round the patient's neck, and spread another on the bed in front of him. Until he is used to the operation, it is likely to make him sick. Lavage is used for cases of dilatation of the stomach, from cancer or

other causes, as it often gives great relief from the sickness and discomfort caused by large accumulations of food, etc., in the stomach. Sometimes the nurse is expected to measure the amount of water used in the process, and also the amount withdrawn by the tube.

CHAPTER IX

CATHETERS AND ENEMATA

CATHETERS are made of glass, silver, and hard and soft rubber. Every time one is used, it must be made surgically clean by boiling it for a few minutes, and putting it into a disinfectant lotion until it is wanted. The nurse must also carefully wash and disinfect her hands, and wash the parts about the meatus with some disinfectant, with the object of clearing away any discharge which, if introduced into the bladder, would probably set up cystitis.

A verbal explanation of how to pass a catheter is not of much use. The patient must lie on her back, and should be uncovered as little as possible. Many good nurses say that they can pass a catheter more easily by the sense of touch alone, than by the use of their eyes, but beginners should always look and see what they are doing, for fear of hurting the patient. Oil the catheter with some antiseptic. Do not use the least violence; if the catheter does not slip in easily, you probably have not found the opening, and if it goes in too easily, it has most likely slipped into the vagina, in which case it must be withdrawn and syringed through with carbolic before you try again. Do not pass it more than two inches, and do not take it out until it has quite done running, when it is to be gently removed, closing the end of the tube with your finger to prevent any drops of urine from falling into the bed. The urine is generally drawn off every six or eight hours after an operation, or oftener, if it seems necessary. Watch the patient well for any signs of cystitis; these would be, a bad smell about the urine—it smells ammoniacal, as if it were decomposing,—a desire to pass it often, and a scalding, severe pain in doing so. If there is the least sign of any of these, report the fact to the doctor at once, and leave a specimen of the urine to be tested. He may order the bladder to be washed out.

For washing out a bladder the things needed are a catheter, with a long piece of indiarubber tubing attached, and a glass funnel fixed on to it, and hot water, with whatever lotion is ordered. Liquor Boracis (Thompson's fluid) is often used, which consists of a mixture of glycerin and boric acid. Two ounces of fluid are added to a pint of warm water. Draw off the urine before putting in the lotion, and then pour a few ounces at a time into the funnel, and let it run out again into a basin placed on the floor. The tube should not be allowed to get full of air, but as soon as the right quantity has been poured in, the funnel should be lowered into the basin to empty itself. From twelve to twenty ounces are generally used at a time, or until the fluid returns quite clear.

Cystitis is such a great and unnecessary addition to a patient's sufferings, that the nurse cannot be too careful in the precautions she takes as to cleanliness. It is, besides, a great reflection on the nurse's skill, if she allows her patient to get cystitis, as it is quite preventable in most cases.

To give a vaginal douche or injection, a vaginal tube of indiarubber or glass is used. This is fitted on to a tube which descends from an irrigator containing the fluid to be used, which hangs a few feet above the level of the patient. She must lie on a bed bath, and it is more comfortable if a pillow is put beneath her back to fill up the space under her shoulders. The tube is oiled before being introduced into the vagina. Five pints or more are frequently used, either of plain hot water, or of water with some disinfectant added. The temperature is ordered by the doctor; a hot douche would mean one at about 105 degrees or higher. The tube used should have holes only at the sides, and not at the top.

When a smaller quantity is to be used, a Higgenson's syringe will answer the purpose, with a vaginal nozzle fixed on it. It must not be used with any violence. When the douche is finished, the nurse should make a little pressure on the perineum, and mop up the remains of the fluid with a little absorbent wool. Patients easily get symptoms of mercurial poisoning from injections of perchloride of mercury, and the nurse should be

always on the lookout for them—diarrhœa, foul breath, etc. She must also be very careful about disinfecting her own hands after performing any of these duties for her patient, and she must be scrupulous in her care in disinfecting bed-pans, etc., after each patient's use. If possible, every patient should keep a vaginal nozzle for her own separate use—at least, let the nozzle used be freshly boiled for each patient.

An "enema saponis" is an injection of soap and water, given for the purpose of emptying the bowel, in cases of constipation, or before an operation or examination. It consists of one ounce of soft soap, dissolved in hot water, so as to make sixteen ounces altogether. Sometimes a table-spoonful of olive oil is added to the mixture. It is given with a Higgenson's syringe. Fill the syringe before inserting the nozzle, and oil the nozzle. See that the other end of the syringe is kept under water the whole time that it is being used, or air will enter, which will cause pain to the patient. Turn the patient on his left side to administer it, with the knees drawn up. The injection should be retained for a few minutes, if possible. The temperature at which it is given should be about 100 degrees, or a little less, and no force must be used, but there is no need to give it as slowly as in the case of an enema which is intended to be retained. If the patient is capable, let him insert the nozzle himself, and there will be no risk of giving pain.

In cases of extreme constipation, and when it is necessary to render the fæces soft, on account of operations in the neighbourhood of the rectum, four ounces of olive oil are slowly injected a few hours before the soap enema is given, from a ball syringe, which should be kept for this purpose, as the oil soon spoils indiarubber.

Whatever syringe is used, it should be cleansed well with hot water, and afterwards with carbolic, and the nozzle should be cleaned with special care. The Higgenson's syringe will last much longer if it is hung up, instead of being bent round inside a box.

Medicinal enemata are used in some cases. An ounce of turpentine mixed up with twelve ounces of thin starch, "Enema

terebinthinæ," is a great relief to flatulence, which is often so troublesome after abdominal operations. Salt and water is sometimes injected to kill worms in children; and alum and water is used for an astringent. "Enema opii," or "starch and opium" enema, is used in cases of severe diarrhœa, or of hæmorrhage from the bowel, as in typhoid. It is made of two ounces of thin starch, nearly or quite cold, to which thirty minims of tincture of opium is added. The patient must be encouraged to retain it as long as possible. Sometimes the pressure of a folded towel against the anus will effect this, until the desire to eject it has passed off. Occasionally iced water is used as an enema.

Glycerin is used in cases of constipation. One drachm is given to a child, and two drachms to an adult, in a special little metal or vulcanite syringe with a long nozzle; but for a child an ordinary glass syringe can be used.

A castor oil enema consists of one ounce of castor oil added to the enema saponis, or to sixteen ounces of thin starch. It is supposed to be more effectual than a plain soap enema.

What to Observe in Nursing

When a patient is admitted into the ward, we notice his general condition, by seeing if he is able to walk, or has to be carried, or walks with an unusual gait; we see if he is apparently in pain, or distressed for breath; if he appears to be in his right mind; and then, unless he is obviously so ill that he must be put to bed instantly, we take his temperature. Before the clinical thermometer was invented, nurses could only guess at temperature by their sense of touch, and this is not to be relied on, as from exposure to cold or from profuse perspiration the skin may feel cool when the thermometer in the mouth shows that the temperature is really high. The normal temperature of the body in health is 98·4 degrees and only varies from this a little according to the time of day. It is generally lowest early in the morning, and rises to its highest point about four or five

in the afternoon. But in sickness the variation may be very great, as much even as 8 or 9 degrees between its extreme points. A temperature much below normal is more alarming than one an equal distance above the normal point: a patient with a temperature of 95 degrees—*i.e.* 3½ degrees below normal, is in a more dangerous condition than one whose temperature is 3½ degrees above normal, which would be trifling in comparison.

To take a temperature, shake down the mercury in the thermometer till it stands at 95 degrees. If the patient can hold it in his mouth without distressing him or without danger to the thermometer, put the bulb under his tongue, and tell him to close his lips upon it without biting it. Leave it for five minutes, read it, and register it at once. Then wash the thermometer, not in hot water, and wipe it carefully, especially about the neck, and put it into carbolic before it is used again. The lips must be closed the whole time the thermometer is being used, or the temperature will not be accurate. Delirious patients and children must not be trusted with a thermometer in the mouth, and when a patient is breathing with difficulty, it is cruel to attempt to take it thus, although this method is a good deal less trouble for the nurse. To take the temperature in the axilla, see that the skin is dry, and put the thermometer in so that the whole of the bulb shall be surrounded by the skin, and place the patient's arm across his chest, with his hand on the opposite shoulder. Put it in and take it out yourself, or you cannot be sure that it has remained in place. For a child you must hold the arm all the time. Sometimes it is easier to take a child's temperature in the groin, and sometimes in the rectum, in which case the bulb should be oiled before being inserted.

Do not take a temperature until quite an hour after the patient has been washed, for washing lowers the heat of the body for the time being; and do not take it in the mouth just after he has been drinking hot tea, or sucking ice, for the temperature of the mouth rises and falls according to what he has taken. Take his temperature *before* you wash him or give him his medicine. Take it at the same time every day, as nearly

as possible, or one day will not compare fairly with another. It happens occasionally that the temperature varies on different sides of the body; in this case, take it on that side where it is found to be highest. If you find an unexpected difference, a sudden rise or sudden drop in the temperature, take it again, either with a different thermometer, or in a different part of the body, and watch the patient for the five minutes. It is better to keep the chart where the patient cannot see it, than to leave it close at hand where he may watch it from day to day with keen disappointment when it shows no improvement.

Count your patient's respiration without his knowledge, or he will not breathe naturally. It is best to count it during sleep, and you need not touch him, it is enough to watch the rise and fall of the bed-clothes; but if you really cannot see any movement, take his hand, as if you were feeling his pulse, and lay it lightly on the upper part of the abdomen, and you cannot fail to feel it. Count it for a full minute, and notice any irregularity in it. The normal rate of respiration for an adult is sixteen; children breathe more quickly. Exertion, even a change of position from lying to sitting up in bed, accelerates the respiration and pulse; and fright, or any other sort of excitement, has the same effect. Train your ear to noticing any difference in your patient's breathing, even in the dark. The rate of respiration should be to the pulse-rate as two is to nine.

Count the pulse for a whole minute, and use a watch with a second-hand. Put three fingers on the pulse, not only one. Sometimes the pulse is nearly imperceptible in one wrist when it can be felt well on the other: so when you think it is very bad, try it in the other wrist before sending off for a doctor. The normal pulse is about seventy beats to the minute, but it is much quicker in a child; in an acute illness a child's pulse often reaches 160 or 180 without any disastrous results, whereas in an adult 120 or 130 beats in a minute shows that he is seriously ill. Notice if the pulse is irregular or intermittent—that is, if it misses a beat every now and then; or if it is feeble, or running. There is a great deal to be learnt about a patient by feeling his pulse; and it is of quite as much importance in

many diseases to watch the pulse as the temperature. For example, a quick pulse with a high temperature is a frequent occurrence, but when the quick pulse accompanies a normal or sub-normal temperature you may think the patient seriously ill. Stimulants, such as ammonia and brandy, quicken the pulse, and some drugs, such as digitalis, slow it. Count the pulse regularly when your patient is taking medicines that affect the heart.

Notice, too, the patient's tongue, if it is dry, or moist, or furred; whether it is raw-beef coloured, or has the whitish appearance that occurs after a long course of milk diet. There is also a special appearance called strawberry tongue, seen in scarlet fever and some other forms of fever, where it is bright red with prominent whitish dots on its surface, while in other conditions of ill-health it is much swollen, and marked at the sides by the teeth. A patient with typhoid is generally beginning to get well when his tongue begins to clean. An alcoholic patient will put out his tongue with a trembling motion, and one partly paralysed will put it out on one side. When the tongue begins to clean up from the edges we think our patient is getting better.

These are all points to watch and remember, for although hospital patients are seen so constantly by the doctors that they do not depend on the nurses for their observation, yet we shall not always be in hospital; and in private practice a doctor expects an accurate account of the patient from the nurse, who should have been trained to notice and report her patient's symptoms.

A sick person's mouth is generally dry in the morning, and always dry if he sleeps with his mouth open. Children should be trained to shut their mouths and breathe through their noses. The mouth is often very foul in sickness, and if the patient is too weak to use a mouthwash for himself, a good nurse will always clean it for him, with a bit of cotton-wool wrapped round her finger, or rolled round a bit of firewood, and dipped in something like glycerin and borax, or a very weak solution of Condy's fluid or formalin. Use a fresh bit of cotton or linen every time, and clean carefully between the teeth and the cheeks, and all the corners of the mouth. The teeth should be kept as clean as

possible, and not allowed to get crusted with milk or the remains of other food.

Notice the state of the skin, its dryness or moisture, and at what time of day the sweating begins, and in what part of the body it occurs; observe the colour, if there is any yellowish tint about the whites of the eyes or any other part, as happens in jaundice; or any blueness about the lips or ears or finger-tips; notice if any part is cold, although the body temperature is high—the feet and nose and ears are often cold, with a high general temperature. And be sure to notice any rash; it may not be an important one, but it may settle the question of the disease from which the patient is suffering. Nurses should know the appearance of sweat-rash, of nettle-rash, of the rash produced by iodide and certain other drugs, and they should always remember in children the possibility of a "crying-rash." A screaming fit will sometimes produce this, and it is often very puzzling. You may send for a doctor in alarm, and then find when he comes a few minutes after peace has been restored, that the "rash" has nearly faded, or even, perhaps, that not a trace of it is left.

It is most important for the nurse to notice the urine: to know the quality and colour of it, and if there is any bad smell, sediment, or any appearance of blood, pus, or gravel; if it is turbid when passed, or clear when passed, and becoming turbid by standing; if it is passed with difficulty or pain. In all illnesses, such as paralysis, and whenever the patient is more or less unconscious, it is especially necessary to know when it is passed and in what amount, whether it dribbles away constantly, which is often the sign of an over-full bladder, or if it is passed at due intervals. And the fact of none being passed for an unusual time should always be reported. It may be that there is retention, and that it must be drawn off; or it may be that the kidneys are not acting at all, so that no urine is being secreted in the bladder, which is a much more serious state of affairs. Whichever way it may be, the doctor should be informed. Sometimes, if it is only a case of not being able to pass it, a change of position may effect it, or a hot poultice or fomentation to the lower part of the abdomen. It is a dangerous practice to put hot water into a bed-pan to

attain the same result. A patient has been kept in bed for weeks longer than necessary in consequence of a blister raised in this way, which in a partly paralysed patient soon became a deep bed-sore. A specimen of the urine of each new patient must be kept for the doctor's examination; it should be taken from what was passed before breakfast; but in cases where the whole quantity has to be measured, save it for twenty-four hours, and shake up the sediment before pouring out a specimen from the whole amount. Remember that it is not the least use to put up a specimen of urine if there is sputum or anything else in the vessel.

Notice the position of the patient in bed. He may lie flat on his back and never move himself, and then it is in many cases the nurse's duty to turn him from side to side, propped over by a pillow, so that he may use all parts of his lungs in breathing; and also that he may not get a bed-sore. There is a condition of the lungs known as "hypostatic pneumonia," which patients get from lying constantly on their backs. But there are diseases in which you must keep the patient quite flat in bed—*e.g.* rheumatism and diphtheria, on account of the risk of heart failure if they raise themselves; and patients suffering from typhoid and other abdominal diseases must be kept lying down, and all cases of hæmorrhage. Patients suffering from thrombosis are also kept in bed entirely.

The patient may sit upright in bed, supported by many pillows, that being the only position in which he can get enough breath. Heart cases can often get an hour or two of comfortable sleep if they have something in front of them to lean their arms and heads upon. A large bed-cradle with a pillow or two on it will do, but a bed-table is steadier; and if you have neither of these you may get an ordinary little wooden table, just large enough to stand across the bed, with two legs on the floor on each side of the bed, and with a pillow or two on it your patient may get into an easy position. These cardiac cases are very distressing from their restlessness and want of sleep, and tax a nurse's ingenuity and patience in contriving some alleviation for them. There are some people who cannot sleep at all in bed, except in an uneasy doze, broken every few minutes by a struggle for breath, who

may get a good night if they are taken out of bed, and put in a high-backed arm-chair, well wrapped up in blankets, and kept out of a draught. But, of course, the nurse must be guided by the patient's feeling as to his position.

The patient may lie on his back with his legs drawn up, which generally means that he has some abdominal pain, perhaps peritonitis. This is sometimes accompanied by a drawn, anxious expression of the face, known as "the abdominal face."

Notice also his restlessness. It is a bad sign after operations, as it may mean hæmorrhage, and it is a bad sign also in heart diseases and typhoid; though too often it is the consequence of a badly-made bed and uncomfortably arranged pillows.

Notice his appetite. Many an invalid will get through his allotted quantity of food, rather than have a fuss about it; but see if he asks for it, or looks pleased to see it coming, or if he wants more. Try to vary it as much as your instructions will allow; a little watercress or marmalade will often help down more nourishing food, but many patients are not allowed these luxuries, nor even as much as an egg. Do not make the mistake of reporting what you have given your patient instead of what he has actually taken; see what is left in his plate or cup when it is finished with.

Always take notice of the amount and kind of sleep your patient gets. There is often a wide discrepancy between the patient's and the nurse's ideas on this subject; but if you are asked about it in his presence, do not contradict him flatly, but take an opportunity of telling the doctor the exact facts, or else hint that the patient had a better night's rest than he thought he had. Sometimes, but much more seldom, you will find a man saying that he has had a very good night, when you have seen him awake twenty times at least; perhaps the difference lies in the absence of pain while he is awake. Notice if there is any talking in sleep, or grinding of the teeth, or the curious groaning which is so common in phthisical patients. If he is sleepless, see what you can do to make him sleep. Sometimes a drink of milk, or even a little solid food, will send him to sleep; or a hot bottle, or a shake of his pillows, and cooling the bed-clothes.

Miss Nightingale says: "Everything you do in a patient's room, after he is put up for the night, increases tenfold the risk of his having a bad night. But if you rouse him up after he has fallen asleep, you do not risk, you *secure* him a bad night."

Be careful to let the doctor know of any change in the patient's condition; if there is any sign of delirium, such as a restless suspicious look in the eyes, wandering in speech, picking at the bed-clothes, or any attempt to get out of bed. This last is continually a sign that the patient wishes to pass urine, when he is too unconscious to express his wants in any other manner.

Notice if there is any twitching of the face or limbs, whether awake or asleep.

Notice the kind of cough. It may be a continual hacking cough, which often accompanies fluid in the chest, or it may be wheezy, as in bronchitis. A child with whooping-cough, ends up each paroxysm with an unmistakable whoop, and often coughs till he is sick. There is a short, dry cough in pleurisy, attended with sharp pain.

See what the expectoration is like. A child swallows what he coughs up, unless he is sick with the effort of coughing, but an adult must always be provided with a spit-cup, and must not be allowed to spit into a handkerchief. Washing spit-cups is a very unpleasant duty, but it gives the nurse who cares to learn an excellent opportunity of distinguishing the various kinds of sputum in various diseases. See if it is profuse or scanty, offensive or sweet, frothy or sticky, if blood-streaked or "rusty." This rusty sputum is such a characteristic of pneumonia that it should always be put on one side for the doctor to see.

A nurse must also know, not only that her patient has been sick, but the appearance of the vomit, the time of its occurrence, whether it is brought on by medicine or food, or by a coughing fit; whether it is attended by nausea, or whether, as often happens in cerebral cases, the patient has no feeling of sickness, but after bringing up the first half of his meal, will finish the rest of it as soon as the sickness has stopped. If food causes sickness, try more simple food till you find out what can be kept down. It is said that, in cases of gastric ulcer, the patient is

sometimes sick in one position and not in another; and in cerebral cases he is sometimes sick only when he sits up. Frequent vomiting is a serious sign, and hiccough accompanying it is also a bad sign. This occurs in hernia and other intestinal obstructions. Long-continued vomiting sometimes becomes fæcal—that is, it consists of the contents of the bowel; it also shows that the patient is in a very serious condition. In obstruction of the œsophagus, food comes back almost as it is swallowed, and without any retching or effort. The sickness caused by renal colic is accompanied with great pain in the loins, shooting downwards; and in the sickness of biliary colic there is often intense pain on the right side, about the gall bladder.

Notice the material vomited, and the quantity of it. There may be large lumps of food, potato or meat, that have not been properly masticated—a child's food should always be cut and mashed carefully, for children will not masticate—or there may be curds of milk in it, in which case it would be well to give the next milk mixed with lime-water, etc.; there may be a distinct smell of alcohol in it; or it may be the greenish white watery stuff that comes up in "chloroform sickness." If there is bile in it, it will be yellow, and in some bad cases of Bright's disease it is green or dirty brown. And when there is digested blood in it, it looks like coffee grounds, or the thick part of beef-tea. Always look for blood in the vomit. It may be from the gums, or from blood that has been swallowed, as in epistaxis; or it may be from the stomach itself. If it is in very small specks and streaks, it is probably caused by the violence of the vomiting, and is of no consequence.

It is most important that the nurse should look at the motions passed by the patients. She must observe the frequency, and the amount of the material; if it is formed in the normal cylindrical shape, or is in the flattened ribbon-like form which indicates stricture of the lower part of the bowel; if it is in large hard masses, called scybala, which indicate that the proper secretions have not been poured into the intestines, so that the motions have become abnormally dry. If the motions are unformed and loose, they may be quite fluid, or may be in colour and con-

sistence like pea-soup, as in typhoid. In cholera, they look like water in which rice has been boiled, and in dysentery, they often contain small scraps of mucous membrane, which have sloughed off the bowel, and these have a peculiar and offensive smell. The colour should be observed. This is produced by bile, and where no bile is poured into the intestine, as in jaundice, the stools are clay coloured, ranging from white to normal. Black, tarry motions are produced by blood which is turned black by the action of the stomach and intestines. These are called melæna, and are seen in cases of severe epistaxis, or hæmatemesis, or gastric ulcer, or in other cases where blood has been poured into the intestine. But iron, bismuth, and lead also cause blackness. The green motions passed by sickly babies are caused by unsuitable or indigestible food. When bright red blood is present, it has come from the lower part of the intestine, and there has not been time for the colour to be changed. Sometimes this is caused by piles. Even the least blood, or even a pinkish colour, in a typhoid motion, should make the nurse suspicious; for a large hæmorrhage is sometimes fatal.

Mucus should be noticed, especially in children. Undigested food is often seen—grape skins, orange pips, or curds of milk, which have passed down too quickly to be digested. Sometimes there is pus in the motion, and sometimes worms. There are three kinds of worms—the round, like garden worms, the thread worms, like tiny bits of white cotton, and tape worms, which are made up of many segments, and are unmistakable, as, when first passed, they hop about, as if each segment was alive.

A rigor is a very important symptom for a nurse to observe. Many fevers, such as influenza and pneumonia, begin with a rigor, and also acute inflammations, such as erysipelas. When a rigor occurs in the course of an illness, it may mean that suppuration is taking place. Hence a rigor is of grave import after an operation. It is an attack of shivering, sometimes just a feeling of chilliness, such as generally begins an ordinary cold in the head, and sometimes so violent, that the teeth chatter, and the patient shakes from head to foot, and may even shake the bed too. The patient shivers and complains of

cold, but to your touch he is hot, and if you take his temperature you will find it raised. Take it as soon as he can be trusted with a thermometer, and again in half-an-hour's time, for the temperature goes on rising after the actual shivering is over. Get him hot bottles, and blankets, and hot drinks, as soon as you can, in the hope of cutting short his rigor, or at any rate of making him more comfortable. Notice the length of time the shivering lasts by looking at your watch, for it is difficult to estimate truly the length of a rigor, or fit, or any attack of the kind, by merely guessing at it. Children do not get rigors as a rule; an acute illness in a child is more likely to start with vomiting or convulsions.

When you want a hot blanket in a hurry, do not half-unfold it, and hold it huddled up in your arms, while you stand before the fire; but open it altogether, begin at one end and warm that thoroughly, roll up the part you have warmed, and warm it lower down; and so go on until it is all rolled up warm together. Then take it, rolled up as it is, to the bed-side. Do not uncover the patient, who is already shivering, but untuck the bed-clothes at the sides; put the roll of warm blanket across his chest under the bed-clothes, and get some one to help you to unroll it towards the foot of the bed, till he has a really hot blanket next him, and his feet well wrapped up in it.

Look also for swelling in any part of the body. When the feet swell in the course of any long disease, like phthisis or cancer, it is generally a sign that the patient is going downhill.

When a patient complains of pain in any part of the body, look carefully for any visible sign of the pain. There may be something that you can relieve, such as a commencing bed-sore.

Bed-sores are not always on the bottom of the back, so that a patient that you suspect may get them, should be carefully examined every day; his back, shoulders, elbows, heels, and hips —any of these may get sore; even the knees and the toes may become sore from the weight and pressure of the bed-clothes, and a sore has been seen on the inner side of the elbow, where a helpless arm lay across the chest. The worst bed-sores we see are on newly admitted patients, who have not been properly

nursed. One does not expect to see them in old hospital cases, for the patients are too carefully attended to. Cleanliness and dryness, and a smooth draw-sheet are the best preventives, but various things are used to harden the skin, and only experience will tell you what will agree best with the special skin you are looking after. Brandy, used in very small quantities, is an excellent remedy; it hardens the skin in some degree, but its chief virtue arises from its being well rubbed in, for the rubbing promotes the circulation of blood in the part that has been pressed on. Brandy just dabbed on is almost useless, as well as being an expensive remedy. Lead lotion hardens the skin also, and so does spirit lotion, which is simply diluted methylated spirit, and has exactly the same effect as brandy. In most cases, a little zinc ointment well rubbed in is enough to keep a back sound, without any spirit, and sometimes zinc or starch powder is useful. But be careful when you wash the skin to dry it thoroughly before applying anything. It is said that common brown soap, just moist enough not to be quite dry, is excellent for preventing bed-sores, if it is rubbed on well. Whatever you apply will be of little use unless you can vary the position of the patient, so that he will not always be lying on the tender spot. This is impossible in spinal cases, which are the worst of all, and impossible also in heart and other chest cases, where the patient can only sit up in bed, and throws all his weight, day and night, on the same place. Water-pillows, water-beds, air-cushions, all have to be called into requisition; and yet, perhaps, a bed-sore may develop in spite of all your care. If it does come, always let the doctor know of it; it is a humiliating thing to have to confess, but he must be told, as he may like to treat it himself. If it is left to you to try to heal, use all sorts of remedies, one after another, till you hit on the right one. Lint wrung out of carbolic oil may suit one skin, and boric acid ointment another; and sometimes one or two applications of resin ointment may do good. A sloughing bed-sore can be cleaned up, like any other wound, with hot boric acid fomentations, but they are inconvenient to apply. A solution of nitrate of silver painted on the skin will harden it, but it makes it black, and blackens the linen too; and

it is recommended also to paint collodion over the suspicious part. When a back is constantly wet, lanolin is very useful, as it protects the skin from the wet. But constant looking after the patient and keeping him dry is the great thing to rely on; never leaving him a minute that you can help without changing the sheet, etc., that has been soiled. When a dressing is necessary for the sore, cut the spread lint the exact size of the place, but cover it with a *much* larger piece of lint or cotton-wool, so that when the dressing is fixed on with strapping, the strapping shall not touch the skin anywhere near the sore. If, instead of strapping, you keep the dressing in place with collodion and gauze, see that the collodion is only painted on the sound skin, and not at all near the edges of the wound.

Sometimes, after a back has been kept in good condition for weeks or months, it suddenly becomes black, and the skin breaks; this is generally a sign that the patient is worse.

Another bad sign is, that the patient is much heavier to move and lift about in bed; he may notice it himself, and say he feels "sinking through the bed." But some patients will help themselves to the very last, and will insist on having their beds made when they are within a very few hours of the end, or will sit by the fire till a few minutes before death.

One also feels uneasy about a patient who does not ask for his food nor care about it, and also when he passes all his evacuations, perhaps unconsciously, in bed. When this occurs in the course of a lingering disease, it is one of the first signs of the end. In acute diseases, such as typhoid, it so often happens that it is of less consequence, and may only betoken a little delirium.

A patient who is getting worse may become very quiet, as happens in spinal disease, or he may be very irritable, as in heart disease. Nothing will satisfy him for two minutes together; he wants to sit out of bed, to have his clothes on and walk about, or even to go home, and he often fancies extraordinary things to eat or drink. In brain disease irritability is a bad symptom. The nurse has to make special allowance for it, and to regard it as a symptom of the disease as much as she would think a rash a symptom of scarlet fever.

Delirium is a bad sign. It may be muttering delirium, as in typhoid or erysipelas; it may be busy and violent, as in delirium tremens; and the patient may be comatose, heavy, and helpless, lying with his eyes shut, and his mouth open, as in cerebral hæmorrhage. In delirium a patient loses his pain; he is not afraid to drag about a fractured leg that he could scarcely bear the doctor even to touch a few hours before; but this relief from pain is no improvement. All pain is often lost during the last day or two of a patient suffering from cancer; and when a man with strangulated hernia suddenly becomes free from pain, it may mean that the injured part has become gangrenous.

Other signs of approaching death are blueness of the lips, ears, and finger-nails; a pinched, sharpened look in the face, and cold extremities. There is a cold perspiration about the whole body, and sometimes twitchings of the muscles.

On the other hand, it is a good sign when your patient wants something reasonable; if he worries for more to eat, or an extra pillow, or a book to read, or if he is anxious to sit up while his bed is made: if a patient will take the trouble to ask for these things, in the absence of bad symptoms, he is probably getting better. It is said to be a good sign in typhoid if he turns on his side, instead of lying listlessly on his back.

A patient convalescent from an acute illness, such as an abdominal operation or an attack of pneumonia, still wants a great deal of attention. Do not be in a hurry with him, nor, on the other hand, allow him to keep on all his old invalidish ways without making any effort towards getting on. Some patients will not make the least move of themselves, and resent any curtailment of the nurse's attention. Give him an extra pillow as soon as he is allowed to sit up, and let him sit up *in* bed for an hour or two at least before you get him on to a chair, even to have his bed made, or he will probably be giddy and faint from the change of position. (And when he does faint, it is essential to lay him flat, and not to attempt to sit him up.) If the illness has been a long or severe one, it is enough to wrap him in a dressing-gown for the first night or two, with socks on, and a warm rug to keep the draught from his legs. Then get him on gradually; let him try

his legs a few minutes at a time, increasing each day till he is able to be up half the day or more. And send him to a convalescent home if possible, unless his home is in the country.

When he is only just beginning to mend, do not let him be worried by visitors. This is easy enough in the hospital, but it is a difficulty to a private nurse, unless she can shelter herself behind the doctor's orders. She should get full instructions as to visitors, and keep strictly to them. As a rule, visitors should be admitted one at a time, and not late in the day.

The last duties to a patient.—When the friends have left the room, undress the body and straighten it, and leave it lying under a sheet for an hour, and then wash it. If there is any wound, the dressings should be taken off, and replaced by a piece of clean absorbent wool bandaged on. Stop up the orifices with tow or cotton-wool. Keep the mouth shut by a bandage passing under the end of the chin, and tied tightly at the top of the head, or by an ordinary jaw bandage. But a better plan is, to fix a firm wedge, such as a roller bandage, under the jaw, resting in the hollow of the throat. This leaves no mark of pressure, as bandaging does. Put on the body a plain white shirt or night-dress, and stockings. In hospital it is wrapped in a mortuary sheet, to which is fastened a card bearing the patient's name, the date of death, and the name of the ward. Notice of death must be sent to the porter, the superintendent's office, and the resident medical officer in charge of the ward, unless he was present at the time. If the death was so sudden that the friends could not be there, send them a telegram, telling them plainly what has happened. It is cruel kindness to telegraph: "Worse; come at once." They rush to the hospital in the greatest hurry, to find on their arrival that there was no need for hurry at all, as it could be of no avail. But the nurse in charge should be careful to notify the patient's friends in time for them to see him again, when there is a change for the worse. She must also send for the doctor, unless she has had special instructions from him to the contrary, as sometimes happens when a patient has been evidently dying for many days.

In cases where the death takes place from phthisis or any infectious disease, the nurse must use a disinfectant in washing the body; and in every case she must carefully disinfect her hands, destroy the washing flannel, and turn out all the bedding to be washed.

It is unnecessary to say that we do these last offices for our patients with the same reverent care that we should like used for our own relations, and for ourselves when our turn comes; without unnecessary talking, and with exactly the same decency that we observe in washing a living person.

A most difficult problem for a nurse is, to know what to answer when her patient asks her plainly if he is going to die. When there is a question of making a will or sending for friends at a distance, it is easy to tell him to be on the safe side, and to make these arrangements since they can do no harm in any case; but when a man has been dying of cancer or some incurable disease for months, yet hoping against hope for improvement, and unheeding the facts that should show him that his life can be but short, it is hard to answer him frankly, and deprive him of the hope that makes life bearable. Neither is it always possible to take refuge in the nurse's usual resource, and tell him to ask the doctor. She can only be guided by circumstances, and must do her best to avoid being hard pressed by questions. It is certainly, from a nursing point of view, a bad thing that the patient should know that the case is hopeless, and nearly every nurse would prefer that the doctor should not tell her that it is so.

CHAPTER X

MEDICINE GIVING AND STIMULANTS

MEDICINES are given in various ways, but the most common way is by the mouth. In giving medicines by mouth, especially if a nurse is new to the work, she cannot be too careful to avoid making any mistakes. It is no use to try to give them quickly at first, it is much more important to be accurate; so take time enough to be very careful. It is so easy, when you have gone round the ward giving medicines at nineteen beds in doses of two tablespoonfuls each, to omit reading the directions on the twentieth bottle, which may be a dose of two teaspoonfuls. It is never a matter of indifference if an over-dose is given; if you have unfortunately made that, or any other mistake in giving the medicines, report it instantly to the proper person; it is possible to make a mistake which would be fatal to the patient, if a doctor were not called in at once to remedy it, by giving an emetic,* or using a stomach pump, or administering an antidote. It is the very familiarity with medicine giving that is apt to make nurses careless; a nurse intrusted with the medicines for the first time will rarely make a mistake.

If the medicine is a very nauseous one, give the patient a drink of water before he takes it, as he will not then taste it so strongly as if he took it into a dry mouth. And always take round with your medicine tray either a jug of drinking water or a syphon of lemonade or soda-water, to give your patient a drink after his medicine. Some hospital patients refuse it, believing that the nauseousness of the draught makes its chief virtue; but most are thankful for it, and in private nursing your patient would always expect something to remove the taste. On your medicine tray

* A simple emetic is a tablespoonful of common salt, or of mustard, stirred up in half-a-pint of warm water. Or give plain warm water, and tickle the back of the throat with the finger, or with a feather.

should be a graduated glass, a small tumbler, and a jug of hot water for washing the glasses after each patient's use. They must be washed and dried with a clean cloth, which you can carry over your arm, before being used for a second patient; besides being dirty, it is a positively dangerous practice to take a glass from one sick person's mouth to another; infection can be easily carried in that way. Of course, if you have a distinctly infectious case in the ward, such as typhoid or erysipelas, or any skin case, that patient has a special glass for his use only, plainly marked, and kept by the side of his bed, and wiped with a special towel.

The three times a day medicines we give at ten, two, and six, and the four hour medicines at the same time, day and night too. Medicines taken four times a day are given at ten, two, and six, and once by the night-nurse, generally before breakfast. Six hourly medicines are given at twelve and six, day and night, and three hourly at three, six, nine, and twelve. Before-food medicines are given quarter of an hour before the three principal meals of the day, and after-food medicines about the same time after them. The medicines given after food are cod-liver oil, iron, and arsenic; in whatever shape they are ordered, whether pill, powder, or mixture, we give them after food. Many other medicines are now and then ordered after food, but these three are always given then, as a matter of routine. The medicines given before food are chiefly bitters, which are ordered to improve the appetite.

Always shake the bottle before pouring out the dose. Even if it looks quite clear, there may be glycerin or syrup at the bottom of the bottle, which, instead of sweetening the whole quantity, is left to form the last dose, unless it is shaken up every time it is given. Some mixtures, made with bismuth or other insoluble powders, need a great deal of shaking, and should be drunk directly they are poured out, before the powder has time to settle at the bottom of the glass.

The fluid measure, used for medicines, is as follows:—

60 minims (m)	= 1 drachm (ʒ)
8 drachms	= 1 ounce (℥)
20 ounces	= 1 pint (O)

Fluid medicines are measured by this scale, and solid medicines by grains. Twenty grains are called a scruple, and sixty grains are a drachm; and 7000 grains make a pound avoirdupois.

Fluid medicines should always be given in a properly graduated medicine glass, for teaspoons and tablespoons differ in capacity. A tablespoonful, as marked on the measure-glass, is half-an-ounce, and a teaspoonful is one drachm, but ordinary household spoons hold nearly half as much again. Use a minim-glass for measuring less than a drachm. If you have only to measure three or four minims, it is better to use a measure-glass than to drop three or four drops out of a bottle, for the size of the drop varies, according to the size of the lip of the bottle and the consistence of the fluid you are pouring out.

Never keep medicines and poisons together. If your patient has a liniment as well as a medicine, put them in separate places, and never on any account keep anything poisonous on the bracket over the patient's bed. If the patient is taking a medicine which he is accustomed to by long use, such as a large quantity of opium, which would be enough to poison another person not used to it, keep the bottle or pill box in a special place, where by no chance could it be given accidentally to the wrong man.

Never give a medicine without reading the label on it, noticing that it is the right bottle for the patient by his name and number on it, that you are pouring out the right quantity, not mistaking a tablespoonful for a teaspoonful, and that you are giving it at the right time.

Find out from the doctor if he wishes his patient to be waked for his medicine. Many persons will take the dose in a mechanical sort of way, and go to sleep again directly; but there are some, who, if they are waked from their first sleep for medicine or for temperature taking, will not sleep again for hours. Of course, if the patient sleeps badly, there is no difficulty, for if he is asleep just at the hour, he will probably be awake again in a little while, and can take his dose. But keep to the regular hours as nearly as you can, and do not omit any medicine on your own responsibility.

Learn all you can about medicines. Do not go round your

ward doling out doses like a machine, but see what each medicine is made of, and try to find out the purpose for which it is given.

And when you do know some of the uses of a few medicines, and the doses of them, *never* prescribe for yourself nor anyone else. Never be persuaded by any ignorant person that a nurse is a sort of unqualified doctor, and that you may as well recommend some mixture or ointment that you have seen used in another case. A nurse is ignorant of the A B C of her profession if she thinks herself capable of undertaking what is exclusively the doctor's work.

The dispensary bill is a heavy item in every hospital's expenditure, and it is within every nurse's power to help keep it as low as possible. Many drugs in common use are expensive; opium and all its preparations, iodide of potassium, and nux vomica; and many drugs used largely in ointments and liniments, such as belladonna and lanolin; cocaine is also very dear, and many tabloids and such like preparations. These things ought not to be wasted and left about to spoil, but should be returned to the dispensary when the patient for whom they were ordered has finished using them. With a little forethought you can often prevent waste; do not send a bottle to be refilled when there is a likelihood of the medicine being changed before the next dose falls due; and cross off the label of the bottle of the patient who is going out, so that it shall not be sent to the ward refilled.

The nurse must also be careful when giving medicine that it is not spilt over the patient's clothing or the bed linen, for it often makes stains that will not wash out. Iron especially stains whatever it touches.

Iron and acids also injure the teeth, and it is a good thing to wash the mouth after taking them with water in which a little bicarbonate of soda has been dissolved. Steel—tinct. ferri perchlor.—is particularly bad for the teeth. Iron also blackens the patient's tongue and his stools.

Some medicines take more effect if they are diluted with a great deal of water, but it is the pleasantest way to take the medicine first and the water directly afterwards.

The aperients most frequently used here are:

Castor oil—oleum ricini— . . .	in doses of ℥ss or ℥i
Calomel—hydrargyri subchloridum— .	,, ,, ,, a very few grains
White Mixture—M.M.c̄.M.S.— . .	,, ,, ,, ℥i or ℥ii
Compound jalap powder—pulv. jalapae co.	,, ,, ,, about ʒss
Pil. Col. et Hyos. Pil. Col. cum Cal. Pil. Nucis Vom. c̄. Ferro } . . .	,, ,, ,, four or eight grains

Medicines are more quickly absorbed when taken on an empty stomach, so those aperients which act quickly, as jalap, salts, etc., are given half-an-hour before breakfast, and they may be expected to act directly after breakfast; but pills, which take some time to dissolve, and act more slowly, are taken over-night, as they are not likely to disturb the patient for some hours.

Castor oil is given floating on a little lemon syrup, or if it is preferred, peppermint water. Some people take it in hot milk, or a little strong coffee. It generally takes effect quickly.

Salts, such as white mixture, pulvis salium, and seidlitz powders, are given in a small tumblerful of hot water, early in the morning.

Jalap is given in water or milk; it does not dissolve, but all the little lumps must be stirred till it is quite smooth, and no little gritty bits left in it.

Most aperient pills are made up in four grain doses, and two pills are an ordinary dose. If they cannot be swallowed, put them inside a bit of bread or a grape or a little jam, or chop them up and try to dissolve them.

Powders may be put inside little cachets made of wafer paper, if they are very nauseous.

It is no use to try to give calomel mixed up in milk, as it is heavy, and the small quantity prescribed will sink to the bottom of the glass and will be left there. You can either put it far back on the tongue, and let it be swallowed with a drink of milk, or it can be put inside a tiny lump of butter on the handle of a teaspoon, and dropped quite at the back of the mouth, where it can hardly fail to be swallowed. This is a good way of giving calomel to half-conscious persons, and it is an aperient often ordered for them. In other cases, it is easily given between two thin bits of bread and butter.

Croton oil, which is a very strong purgative, is administered in butter in the same way. The dose is one, or, at the most, two minims. It may be dropped on a dose of castor oil instead of being given in butter.

The constant use of aperients can often be avoided by care in diet. Patients often know what will cause an action of the bowels, and, if there is no reasonable objection, they may as well try their own remedy, whether it be a baked apple, or a fig, or brown bread, or a morning draught of hot water. Fruit, green vegetables, meat, and brown bread would tend to overcome habitual constipation, while a milk diet and rest in bed would tend to cause it. Perhaps this is partly the reason why our hospital patients so often need daily doses of purgatives, and why they generally need larger doses than are taken by persons leading an active life. On the contrary, one often sees an attack of diarrhœa cut short by exclusive milk diet, with warmth and rest in bed, without any medicine.

Most insoluble powders are stirred up in a little milk and drunk quickly, before they have time to settle at the bottom, as quinine; and some powders, as chloralamide, which do not dissolve in water, can be dissolved in a teaspoonful of brandy, and a little water can be added afterwards. Hot water will often dissolve a powder when cold water has no effect on it, but the heat sometimes alters the properties of the powder, and it is better simply to suspend it in milk or water.

Sleeping draughts are given when the patients are being made comfortable for the night, and it is the practice in the hospital to give them about ten, when the ward has settled down after the change of day and night nurses. Some drugs, like sulphonal, act slowly, and must be given two or three hours before bedtime.

It is so easy to get into the habit of not sleeping without a draught, that a nurse must always be on her guard against it. If a draught is ordered for "every night, if necessary," she should do her best to make her patient sleep without it, and encourage him to try to do so. And she must always watch a patient carefully who has had a sleeping draught, especially if it has been given for the first time; and she must notice if there is any nausea or headache in the morning after it.

Perhaps opium, in some form or other, is most often used as a sleeping draught. Opium is made up in half-grain, or one-grain pills, and is also frequently given in the shape of Dover's powder or pill, which contains half-a-grain of opium in every four grains. This is also called "Pulv. Ipecac. Co." Tincture of opium, commonly called laudanum, is another preparation. Opium takes a great effect on children, and the dose given them is proportionately much smaller than that of other drugs. When a patient is taking opium, whether regularly or as an occasional dose, watch his respiration, which may become very slow; and his pupils, which are contracted when under the influence of opium, until they are sometimes mere points.

Opium is the great remedy for pain; but it must never be taken or given without orders from a medical man. It causes constipation, and is much used in cases of diarrhœa; and it is given in hæmorrhage from the lungs, the intestine, and elsewhere. Many cough mixtures have a little opium in them, and some cough lozenges have either opium, or morphine, which is a preparation of opium, added to them. Opium diminishes the secretions of the body, and so upsets the digestion and spoils the appetite. It takes great effect on persons suffering from Bright's disease, and doctors always examine the urine of a patient for albumen before giving him opium. The dose of opium has constantly to be increased, as the quantity that would relieve pain or send the patient to sleep the first time of taking it would very likely have very little or no effect after having been repeated several days following.

Oxymel, cascarilla, senega, and carbonate of ammonium are used for cough medicines, as well as the various sorts of linctus. This is a syrupy sort of medicine, which is to be swallowed slowly, that it may affect the throat. It contains a small quantity of opium, morphine, or belladonna, with syrup. An irritation of the throat causing a cough is sometimes stopped by a hot drink; a mixture of equal parts of lemon syrup and very hot water is often effectual. Another useful cough remedy, which it is in every nurse's power to administer, consists of five ounces of boiling milk with five ounces of soda-water, and if the patient is taking

stimulants, with half-an-ounce of brandy added to it. This acts as an expectorant, if it is taken the first thing in the morning.

Solid medicines administered by the rectum are called suppositories. Morphine and opium suppositories are used for pain after obstetric or rectal operations; iodoform suppositories for the sake of sweetening a foul discharge; glycerin suppositories sometimes take the place of glycerin enemata to open the bowels.

When medicine is given by the lungs, it is in the form of a steam or other spray, or it is finely divided in an atomiser, or is mixed with boiling water in a bottle of a suitable shape, with a mouthpiece for inhalation. The drug used is generally something to disinfect the air passages, as creosote, and a few drops only are used.

Drugs are occasionally administered as an inunction—that is, they are made up into an ointment, and rubbed into the skin. Weakly babies are rubbed with cod-liver oil, and cases of tuberculous peritonitis have mercurial ointment applied to the abdomen.

Medicines given by injection under the skin are called hypodermic or subcutaneous. The great advantage of this method is, that the medicine takes quicker effect than those drugs which have to be absorbed by the stomach. A morphine injection will relieve pain and send a patient to sleep in a very few minutes, whereas the same amount of morphine taken by mouth might be quarter of an hour or more before it gave any relief. So, also, when a patient is too ill or too collapsed to be able to swallow, an injection of brandy or strychnine or some other stimulant may pick him up until he is able to take something by mouth. The greatest caution is needed in measuring and giving hypodermic injections. The solution used is strong, and one minim more or less of it makes a great difference to the patient. Use a syringe, if possible, that can be cleansed by boiling it; keep the needle dry, and keep a silver wire in it to prevent its being clogged up by rust. Give the injection, as a rule, in the arm. Always see that the syringe is in good working order, by filling it with water before you use it. Take up the required amount of morphine, etc., into the syringe, measuring it by the little marks on the

piston. Pinch up the skin with the left hand; hold the syringe by the barrel and drive the needle through the skin for nearly an inch. If it is done quickly with a sharp needle, it is not much more than a prick. Then push the piston down and withdraw the needle, and leave your finger on the puncture for a few seconds, gently rubbing it at the same time.

Do your very utmost, in giving medicine to a child, to make him take the first dose quietly; if you let him get the better of you at the beginning, he will probably end by refusing to do or take anything that you think desirable, but to which he objects, for sick children do not generally grow more reasonable as their illness increases. Medicine is made so palatable for young children that there is not much excuse for their refusing it on the score of nastiness. If they can be persuaded to take the first dose or two of cod-liver oil, it is quite likely that they will end by thinking it a luxury.

A little ingenuity will often make a child take its medicine better than force. Extract of malt is a commonly ordered medicine for a child; if he refuses a spoonful of it plain, it can be stirred up in a little hot milk and given as a drink; and if he still objects to it, he will most likely take it quite willingly, when spread like jam, on a piece of bread and butter.

Stimulants

Alcohol is generally ordered in the hospital in the form of port wine or brandy, and champagne is occasionally used in very critical cases.

When brandy is given as a stimulant, it must not be too much diluted; it is enough to add two parts of water to one part of brandy. Children must, of course, have more water added. The brandy must be given frequently, for the stimulating effect soon passes off, and depression follows; and as it has to be given often, it must be in small doses. The average amount given to a patient is three ounces in twenty-four hours, and this quantity

is divided up, according to the state of weakness or collapse he is in.

Three ounces are equal to twenty-four drachms, therefore you can give one drachm every hour throughout the day and night, if it is necessary, or two drachms every two hours and so on; but in ordinary cases we give half-an-ounce—*i.e.* four drachms, every four hours. The doctor invariably settles the amount of stimulant to be taken, and it is well if he will also fix the times for taking it. When it is just given to increase appetite, see that it is ready at meal times, and if it is given as a "night-cap" to promote sleep, give it when the patient is settled up for the night. Wine should, as a rule, be given with meals, but if wanted between meals, it is a good plan to beat it up thoroughly with the yolk of an egg. Four or six ounces of port wine is the quantity generally ordered, and it should be given two ounces at a time. Egg and brandy mixture is often used for patients who take their food badly. It is made of the yolk of two eggs added to four ounces of brandy, four ounces of cinnamon water, and a little sugar. The dose is one ounce. But it is often better liked if the egg is beaten up with half-an-ounce of brandy and an ounce of milk, and very slightly sweetened.

Alcohol is a drug, and is ordered by the doctor as a part of a patient's treatment, in the same way that he orders digitalis or ammonia or quinine. A nurse would not dream of dosing her patient with these things on her own responsibility, neither should she take upon herself to administer brandy. Except in cases of extreme urgency it should not be given without the doctor's order—such an exception would be immersion cases, or a sudden collapse in a heart case, where death seems to be imminent—and when brandy *is* ordered the nurse must not exceed the prescribed quantity. There is no reason, because brandy has once been ordered, that the patient should go on taking it after the necessity has ceased, or during convalescence. One often hears it said, "The doctor told me"—perhaps twenty years ago—"that I must take a little whisky at night"; that fact is remembered, while the other treatment that accompanied the stimulant was dropped for good and all when the bottle of medicine was

finished. Remember how easy it is to get into the alcohol habit, and what a fatal habit it is, especially for women, and do your best to prevent your patient from falling into it. A physician gave some good advice here lately when he said, "Don't leave the choice of times for taking stimulants with your patient, for it has been well said that the time never to take stimulant is when one feels one wants it."

Alcohol is not given in cases of hæmorrhage, for if the heart is stimulated, the blood circulates more rapidly and the hæmorrhage increases. The first remedy that occurs to the mind of anyone who sees a person in an unconscious condition or in a fit is probably brandy; but if the unconsciousness is a consequence of cerebral hæmorrhage, or of a dozen other causes, the brandy will do harm.

Alcohol is rarely given in nephritis. It is used in large doses in pneumonia, which is a short acute illness; but in such diseases as typhoid, which will certainly last three weeks, and may last twice as many months, brandy is given at first in very small doses, if it is ordered at all, perhaps one or two ounces in twenty-four hours, and increased as the symptoms point to it, until at the height of the illness six or eight ounces are given. More than this is seldom ordered.

Champagne is given one ounce at a time, every two or three hours, or oftener, according to the gravity of the case.

Notice the effect of the alcohol on the patient's temperature and pulse, and if it produces sleep, or quiets delirium.

Very small doses of brandy are given to babies; five or six minims every two hours, well diluted with water. Do not give it to a child in milk, or he may take such a dislike to it that he will refuse milk altogether.

CHAPTER XI

ANÆSTHETICS—OPERATIONS

ANÆSTHESIA is a condition in which there is a loss of sensation. Whatever produces this condition is an anæsthetic. Excitement, or fright, or other mental emotion may be anæsthetic; for example, we often see patients apparently forgetting all their pain when an unexpected visitor arrives.

The anæsthetics commonly used during an operation are of two sorts.

1. Those which produce loss of feeling in the part to which they are applied, of which the most frequently used is cocaine. In ophthalmic operations a solution is dropped into the eye; and for examinations and small operations about the throat it is either sprayed into the throat or painted on the part that is to be operated on. It is given as a hypodermic injection if the operation is on the skin, as cocaine applied to the skin has less effect than it has on the mucous membranes. In either case the anæsthesia is produced in about five minutes. Cocaine is also most useful in cases of painful swallowing, from ulceration about the mouth or throat. A cocaine lozenge slowly sucked before food is taken gives great relief, or the ulcers themselves may be touched with a bit of absorbent wool dipped in the solution. Cocaine is one of the most expensive drugs in common use, and should be economically used.

Another local anæsthetic is ethyl chloride, which is sprayed on the skin, and is so intensely cold that it freezes the surface. The effect of this passes off much more quickly than cocaine. No special preparation is needed for the patient who is only to undergo local anæsthesia, but careful preparation is necessary for the patient who is to be rendered unconscious by an anæsthetic.

2. Those drugs which produce total anæsthesia are chloroform, ether, the A.C.E. and other mixtures, and nitrous oxide gas.

Various mouthpieces and inhalers are used, and chloroform is occasionally given on the corner of a towel, or a large piece of lint. The nurse should see that the inhalers are kept clean, with fresh flannel linings, etc., as required. The A.C.E. mixture is made of one part of alcohol, two parts of chloroform, and three parts of ether. Nitrous oxide gas is used for dental operations, and for any case that needs a very short period of insensibility.

If you know in time that an anæsthetic is to be given, let the patient have a warm bath the evening before, and he will also be ordered a dose of some opening medicine over-night, which the nurse must supplement by a soap enema in the morning, if the medicine has not acted in reasonable time. If the operation is to be about two o'clock, let him have a light early breakfast, and half-a-pint of good beef-tea about ten; and after that time give nothing except a little water or soda-water in case of great thirst. This is to prevent vomiting during the operation, which is inconvenient to the surgeon, and dangerous to the patient, from the likelihood of the vomit getting into the air passages.

If an out-patient is coming up for a small operation, give him directions about food and medicine, that he may at least be partly prepared. See that all the clothing is quite loose before the patient gets on the operation-table, and, in the case of a female, make her unfasten or take off her stays, and loosen her collar, and all waistbands and strings.

Always see that any artificial teeth are removed, and provide a porringer and towel in case of sickness, and a hypodermic syringe filled with brandy, and some nitrite of amyl capsules. It is well also to have strychnine and ether for injections, and a large sponge and boiling water near at hand, in case of emergency. If the operation is about the mouth or throat, get some ice in addition.

When the operation is likely to be a serious one, the nurse must find out if the patient wishes her to write or telegraph to his friends to let them know the result of it. They may be expected to come and inquire for themselves if they live within a reasonable distance. It is of great importance that when a new patient is admitted, his address shall be exactly and correctly entered in

the address book—not on any odd slip of paper, which may be lost; and in all cases the London district, or county, or post town should be added. Ask, too, if he has any friends at the address he gives, or whether it is only a lodging or a place of business. It will probably be impossible to ask him all these questions after a serious operation, or if he becomes delirious or comatose, and even if he could answer them, you neither want to disturb him with questions, nor to frighten him into thinking himself worse than he is, as he will think, if he finds out that you are telegraphing to his friends.

Always ask a new patient on admission what religion he professes, and give him the opportunity of seeing a clergyman before the operation.

When you are preparing the patient for the operating-table, see that he is warmly and suitably clad. There must be nothing tight about the neck or waist; if the operation is about the trunk, let the garment be open down the back, so that it can be instantly removed. Put on warm stockings, or, if the weather is cold, bandage his arms and legs loosely with well-aired cotton-wool. A flannel shirt or short jacket is more convenient than a suit of pyjamas, and this may be supplemented by a loose cotton wool jacket if necessary. Part the hair of a female patient, and plait it in two tails, and fasten it at the top of her head to be out of the way of the anæsthetist. It is well to avoid using hair-pins. Carefully wash the part that is to be operated on, and prepare the compress, which will probably be applied by the doctor a few hours beforehand. The necessaries for a compress are hot water, soft soap, liquor potassæ, a nail-brush, lint, jaconet, bandage, a mackintosh, and whatever disinfectant the doctor prefers, generally either lysol, perchloride of mercury, or carbolic lotion.

Then think about the operating room and table. The room must be well warmed; 70 or 75 degrees is not too hot, and whatever the weather may be, light a fire in the grate, as you are almost sure to want hot water and hot blankets. Of course, the room should previously have been made as clean as possible, the chimney swept, windows cleaned, walls wiped down with a

damp cloth, carpets and unnecessary furniture removed, floor scrubbed, and suitable bed and bedding provided. Put the table wherever the light is best; it should be about six feet by two, and of a convenient height for the operator. If the table has a zinc top to hold hot water, fill it half full of water at about 120 degrees, and whether the table is of wood, metal, or anything else, put three or four thicknesses of blanket upon it, to lessen the chance of a bed-sore, which might easily be produced in a very thin person, by the pressure necessarily exerted during the operation. Besides this, if the table is filled with hot water, the patient may be burnt unless there is a good covering of blankets. Put a sheet on the blankets, and lay on the sheet one mackintosh to be under the pelvis of the patient, and another to be under the part that will be operated on. Hang a blanket and two or three more mackintoshes to warm by the fire, and have a couple of hot bottles ready.

The steriliser, or a large clean saucepan, must be ready to boil towels, instruments, etc. Let all glass things be a little warm before they are put into boiling water, or they may crack with the sudden heat, and glass syringes should be filled with very hot water. Boiling spoils leather, so pumps and syringes with leather suckers must be cleansed by long soaking in strong carbolic.

Get ready plenty of scrupulously clean basins and porringers and dishes for the instruments, towels, both dry and soaking in disinfectant, and a bucket, or foot-tub, to empty basins in. There should be abundance of the kind of dressing that the surgeon is likely to use, bandages, according to what the operation is to be, safety-pins, lint, absorbent wool, and sponges. Sterilised absorbent pads are generally used in place of sponges; they are made of absorbent wool or cellulose, which is cut in pieces of varying size, and covered with gauze, or the thicker material called bandage cloth. A useful size for these pads is three inches by two. They are tied together with a bit of thread in bundles of half-a-dozen, and are sent to be sterilised in bags of Gamgee tissue. These bags, when returned from sterilisation, are kept in a tin box till they are wanted.

When real sponges are used, they must have soaked in 1-in-20

carbolic lotion for at least twenty-four hours previously; they are spoiled by boiling. They should be counted carefully both before and after the operation. During the operation they are washed in cold water, and then wrung out of hot lotion before they are handed again to the operator. When they are finished with they may be put in strong soda and water for twelve hours, at the end of which time they can be squeezed out and washed in several waters, and all the stains will disappear. The sponges should then be kept in 1-in-20 carbolic until they are wanted again. If the sponges are not often used, the carbolic should be changed occasionally.

The patient should pass urine immediately before he has the anæsthetic, and if there is any difficulty about it, the surgeon should be told, as he may think it desirable that a catheter should be passed.

The nurse must be on the alert during the operation that she may have everything ready at the instant it is wanted. It is not necessary for her to watch what is being done, but it *is* her business to be ready with sponges, lotions, and all the numerous things that may be wanted, as soon as the operator needs them. She should see that the washing basins are kept supplied with clean hot water, and that the basins of lotion, used for disinfecting the surgeon's hands from time to time, are constantly changed as they become dirty; she should not wait to be asked for those things which it is her obvious duty to provide.

As soon as the patient is moved from the bed to the operating-table, get the bed ready for him to be put back into it, as you do not know how long the operation will take, nor if some accident will prevent its being done at all. Remember to put a mackintosh under the draw-sheet, and prepare a hot bottle and blanket. Get a splint, cradle, wedge-pillow, sand-bags, etc. ready, if either of these is likely to be wanted.

After the patient is in bed again, keep his head low, and do not leave him alone until he has recovered consciousness. Give him the chance of sleeping as long as possible. Do not worry him by talking to him, and still less by talking and whispering near his bed, which is a great annoyance to some patients, and

a very unnecessary one. Turn his head on one side, and arrange a towel under his chin, in case of sudden sickness. Watch his pulse and respiration, his colour and general appearance, and on no account let him be cold. Watch that there is no bleeding from the part operated on, and that the dressings do not get shifted. After a severe operation an enema of hot port wine or of brandy and water is often ordered; this can be given as soon as the patient is put back into bed, and before he regains consciousness. If the operation has been a slight one, the patient may be fed with milk as soon as the sickness has stopped, and in a day or two will be on his ordinary diet again, but after abdominal, throat, and other severe operations, very great care has to be exercised about the feeding. Abdominal cases are often fed only by nutrient enemata for four or five days; or they may be left for twenty-four hours without any sort of food, except a few teaspoonfuls of hot water, or they may be fed by teaspoonfuls of milk and barley-water given at hourly intervals; three or four ounces being given in the first twenty-four hours, about half-a-pint during the next day, and so going on gradually till the full amount of three pints is being given. Solid food is generally withheld after an abdominal operation, until there has been a satisfactory action of the bowels. Find out from the doctor how long you may leave your patient to sleep without waking him for food. A good nurse will often manage to give her patient a drink without rousing him, especially if he is under the influence of morphia.

Patients who are kept constantly lying flat in bed often complain of an aching pain in the hollow of the back; this can be relieved by placing a small flat pillow under the back, or a pad of tow and cotton-wool may be found sufficient. The first time a patient is allowed to lie on his side, he will be more comfortable with the support of a firm pillow laid closely in against his back.

There are several ways of lifting a patient to wash his back. When the nurse is single-handed, and the patient not very heavy, she may get her hand under him, and planting her elbow firmly on the bed, she can raise him an inch or two with one hand, while she does the washing with the other. But it is more

convenient for two persons to work together; one stands in front of the patient, and takes him by the hips and lifts him a little while the other washes; and if he is too heavy for this arrangement, a nurse must stand at each side joining hands, under the small of his back and under his knees, while a third one washes. Operation cases can generally be turned on one side after three or four days, but fractures often have to be lifted in this way for a long time, even for months.

When a patient is to be dressed, the nurse should remember to prepare everything that is likely to be wanted, so that she may not delay affairs by having to fetch what she has forgotten in the middle of the dressing. She must see that the steriliser is boiling, that there is a sufficient supply of pads, wool, gauze, etc., lotion and lint, syringe and dish, iodoform or silver nitrate, or anything else that is being used, towels soaked in lotion, bandages, mackintosh, and a basin for the dirty dressings. She must arrange the bed and clothing, and must be careful to keep her own hands away from the wound. She must hand the things as they are wanted, without waiting to be asked for each separate one. It is better to burn the dirty dressings immediately they are taken off than to put them into the dressing-pail; and the dirtier they are, the more quickly they should be destroyed. After ovarian operations, and general abdominal operations, the urine must be measured for a week or so, as the amount passed forms one indication of how the patient is progressing. She must be kept as still as possible, and on her back only, until the doctor allows her to be turned. Notice the bandages frequently, as they are apt to ruck up. It is a good plan to put on a spica over the original bandage, or to use two pieces of bandage fastened in front, passed between the thighs, and pinned to the bandage at the back, one on each side. Never neglect any complaint of pain, especially abdominal pain, and mention it to the doctor. Notice also if there is any hiccough, which is a bad symptom. Flatulence is the cause of much pain after these operations; it is generally impossible to relieve it by any medicine given by mouth, on account of the chloroform sickness, but a rectal tube can always be tried, and is often successful. It is a long tube, about

the size of a vaginal douche nozzle, which is oiled and passed up the bowel for ten inches or thereabouts, and through which the flatus passes. The doctor often orders a turpentine enema in these cases.

For rectal operations it is essential that the bowel shall be empty; at least one large enema is given a few hours beforehand. A T bandage will be required in these cases. They are kept altogether in bed until the doctor orders them up.

Before all obstetric operations and examinations also, it is important to empty the bowel thoroughly by medicine followed by an enema.

There are two or three operations, the success of which depends largely on the nursing, one of these is the operation for ruptured perineum. This is an accident which happens to women in difficult confinements. The perineum, which is the part between the vagina and the opening of the rectum, gets torn right through to the sphincter muscle which closes the rectum. When this is torn, there is no longer any power to close the bowel, so that the patient has no control, or at the most, very small control, over her motions. The operation consists in stitching the torn parts together again. When this is done directly after the confinement, and the parts kept clean, and the patient lying still, it generally heals up without much trouble, but when it has been neglected, it is a more severe operation. Before the patient is put on the table, there must be in this, as in all obstetric cases, a thorough cleansing, and as far as possible disinfecting, of the parts to be operated on; and a douche of some disinfectant is generally given. After the operation the patient is kept absolutely still, lying on her back, with her knees, which should be tied together till she has regained consciousness, raised on a pillow. She probably will not have her bowels opened for several days, until there is some strength in the parts that have been sewn up; castor oil, and an enema of four ounces of olive oil, followed by a soap enema, is then given. She must on no account be allowed to strain. A catheter must be passed regularly every six hours for about three days. The nurse must be very careful about doing this, as the wound will be very tender,

and the least roughness will pull at the stitches and lessen the chance of union. There is sure to be some discharge, which will make the stitches dirty; they must be kept as clean as possible, and syringed or gently bathed two or three times daily, and after every time that the bowels act. The catheter is sometimes a "sigmoid," a specially shaped one, which is left in altogether, and drained into a boat-shaped vessel in the bed, which can be kept steady by means of a small sand-bag; but it must be taken out at least once a day, and cleansed and disinfected. The diet will be milk only, for a few days, until the bowels have acted.

A recent amputation wound should never be covered by the bed-clothes; it must be left *outside* the bed, covered by a small piece of blanket only, so that bleeding can be watched for constantly without moving the patient. Arrange also a small piece of mackintosh, and a draw-sheet under the leg, in such a manner that if there is the least suspicion of bleeding, the draw-sheet can be pulled through for inspection without lifting the leg.

Hernia is caused by a part of the contents of the abdomen finding its way through the abdominal wall, and causing a swelling. In most cases it can be pushed back, or reduced; but it is sometimes *irreducible*, and is then always in danger of becoming *strangulated*. The symptoms of strangulation are nausea, sickness — which becomes fæcal — constipation, headache, a feeble, rapid pulse, and severe pain. A surgeon should be sent for without delay, and, meantime, the patient should lie on his back, with a pillow under his knees, and an ice-bag applied to the swelling. All vomit should be saved for inspection, and nothing given to the patient except an occasional teaspoonful of water.

The chief varieties of hernia are Umbilical, Inguinal, and Femoral.

CHAPTER XII

OPHTHALMIC NURSING

THE eyeball is a globe about one inch in diameter, covered by three coats, of which the outside coat is the strongest —viz. the sclerotic, commonly known as the "white of the eye." The greater part of the eye is filled up by the vitreous humour, a jelly-like substance, which is contained in the vitreous chamber. In the front of the eye the sclerotic is replaced by a transparent substance, the cornea; and behind the cornea is the cavity called the anterior chamber, containing a clear watery fluid, the aqueous humour. At the back of this cavity is the iris, a circular muscle with a hole in the centre, which becomes larger and smaller as the iris contracts and returns to its original state. By this means the iris controls the amount of light to be admitted into the eye. The iris is the coloured part of the eye, and the pupil is the opening in its centre through which we look into the dark cavity of the eye. Close behind the iris is the crystalline lens, a quite transparent substance, in shape doubly convex—*i.e.* like an acid drop or a lentil seed, from the latter of which it gets the name of lens. It has the power of becoming flatter or rounder, as is necessary for the proper focussing of the rays of light on the back of the globe.

At the back of the eye is the retina, continuous with the optic nerve, which receives the rays of light, and conveys the impression of light to the brain. When the eye is examined by the ophthalmoscope, we can see the veins and arteries of the retina, and the optic disc. The disc is the optic nerve as it enters the eyeball.

The conjunctiva is a delicate membrane which lines the eyelids and turns back over the front of the eyeball. Inflammation of this membrane is called conjunctivitis.

The lachrymal gland, situated above the outer end of the eye,

secretes the salt fluid which continually keeps the eye moist and clean. The action of the eye and the lids moves the fluid along, until it enters the lachrymal duct, and is conveyed to the nose. When the fluid is secreted in excess, it overflows in the form of tears.

The eyelids and the sensitive lashes serve as protection to the eye.

A great many cases of total blindness are due to neglect of the eyes of the newly-born infant. The eyes, immediately after birth, should be wiped gently with a soft rag dipped in boric acid lotion, and the lids should be separated, and a few drops of the lotion dropped right into the eye. The child's face ought always to be washed with a different sponge or flannel from that used for the rest of its body. If any discharge appears in the eyes the bathing and dropping in of the lotion should be continued frequently until the eyes are quite free.

It is important to remember that all discharges from the eye are likely to be contagious, and the more the discharge resembles pus, the more contagious it is likely to be. So all rags, etc. used for cleaning the eyes should be burnt, and towels washed and boiled before they are used for another person.

Purulent ophthalmia is much the same as ophthalmia neonatorum (of the newly-born). It is caused by poisonous material which has found entrance into the eye, and which sets up severe inflammation of the conjunctiva, with much swelling, pain, and thick discharge. If it is neglected, the eye sloughs and is destroyed, and there is great risk that the discharge will affect the sound eye. The eye is bathed with boric acid lotion very frequently, the swollen lids being separated to let the discharge flow out; and this treatment must be carried out day and night while the acute stage lasts, even if the patient has to be attended to every half-hour or oftener. No one who is nursing a case of this kind should be allowed to attend to any other person's eyes, and she should be most careful about disinfecting her hands every time she has touched the affected eye. It is well for her to avoid putting her hands up to her face, and to avoid splashing her face

with any lotion that she may be using for her patient. The greatest care must be taken to avoid infecting the patient's sound eye; he is kept as far as possible lying on the side of the affected eye, so that the discharge cannot run down into the other. A Buller's shield or other protection must be worn on the sound eye to avoid contamination.

Another infectious disease of the eyes is **trachoma**, commonly called "**granular lids.**" The conjunctiva becomes red and thickened and roughened by granulations, and there is always more or less discharge. The cornea is often affected also. The treatment is, painting the everted lids with blue stone, a solution of nitrate of silver, or some other caustic; and the eyes are kept clean by bathing with boric acid lotion several times a day. Sometimes an operation is necessary. Trachoma is often epidemic in large schools, and, to prevent its spreading when a case does occur, each child ought to be provided with sponge and towel for its own especial use, the use of any common towel being forbidden.

Ulcers sometimes form on the cornea, and interfere more or less with its transparency, as in healing they leave scars, or opacities. A prominent symptom of corneal ulceration is photophobia, dread of light. A child suffering from it will keep his eyes tightly shut, and his head buried in the bed-clothes. The application of ointments and other remedies may cure a slight case, but the ulcer has often to be cauterised under an anæsthetic.

Cataract is an opaque condition of the lens, which prevents any light from being transmitted to the retina. It is so called from a fanciful resemblance between the whitish appearance of the eye and the white water as it falls over a cataract. The operation for its cure is extraction of the lens, the place of which is afterwards taken by suitable glasses to refract the rays of light entering the eye. Cocaine is the anæsthetic generally employed in operations for cataract, as its use prevents the retching and straining consequent on the administration of chloroform, which would be particularly harmful to an eye that had just been operated on.

The patient is kept entirely in bed for two to four days, not being allowed to get up for any purpose. He is also kept on soft diet, with the object of preventing much movement of the muscles of the face. The eye is dressed with dry antiseptic gauze and wool, which is changed for the first time in about forty-eight hours, and afterwards once a day, but both eyes are bandaged up for about a week. The nurse must be watchful for any purulent discharge from the eye, which would be a symptom that something was going wrong. Much pain would also be a bad sign. After a week, the patient is allowed the use of the good eye, with the protection of a shade. He is tested for glasses in four or five weeks' time.

Excision of the eyeball is performed for disease or injury that is too bad to be repaired. The socket is tied up with dry gauze for about a week, when a small shade replaces the bandage. Some pressure is put on just at first to stop the bleeding, but after the first day the socket must be kept clean by syringing with warm boric acid lotion three times daily. In about five weeks the socket is healed firmly enough to wear an artificial eye. A small eye is worn at first, and is then changed for one a little larger, and so on until at the fourth change the permanent eye is put in. A glass eye should not be worn at night, and when it is taken out, the socket should be thoroughly cleansed with warm water. It will not last more than a year, as it becomes roughened by the action of the lachrymal fluid, and irritates the eyelids, setting up inflammation in them. A glass eye should be wiped dry and kept in a soft rag when it is out of the socket.

Evisceration is the removal of the contents of the eyeball, without the excision of the globe. This operation causes more general constitutional disturbance than excision, but it is frequently performed in its place for children and young people, as it leaves a better stump to hold the artificial eye. After evisceration there is often a great deal of swelling and inflammation about the eye. The patient is kept in bed for some days, and his temperature is taken every four hours.

Cases of accidental injuries to the eye are generally kept tied up, until the surgeon sees them, with hot belladonna fomentations to relieve the pain. Cocaine dropped into the eye is of no use for the relief of such pain.

Injury to an eye that is not attended to properly sometimes sets up "sympathetic ophthalmia" in the sound eye, which may lead to the total loss of sight. An eye that is affected in this way is kept tied up, sometimes for many weeks, with a black bandage, and a large shade is worn, so that every ray of light may be excluded.

A **stye** is a tiny boil at the root of an eyelash. The eye should be fomented and tied up with a hot compress.

A **foreign body** in the eye, if it cannot be seen at once, is generally found under the upper lid, which must be everted—turned inside out. The nurse tells the patient to look down; she then lays hold of the lashes and draws the lid downwards and away from the eyeball; with the other hand she lays a small pencil, or probe, or knitting needle, along the top of the lid, and thus steadies it while she draws the edge of the lid upwards and turns it wrong side out. The foreign body is then generally visible, and can be removed with a soft rag. A little practice will enable the nurse to evert the lid by the use of her fingers only, and, if she is very skilful, she may be able to do it with one hand.

Several forms of bandage are used for the eye, but the most common is a single turn of bandage which should pass below the ear on the affected side, and is tied near the top of the head, where it is less likely to slip. A bandage for both eyes is sometimes made of a strip of calico or other material, six inches long and two and a half inches broad, to each corner of which a tape is sewn. Each pair of strings is then knotted together, and they are tied at the back of the head.

Shades are made of cardboard covered with dark green or black calico. A shade should always be destroyed after a patient has finished using it, on account of the risk of carrying infection.

Drops are put into the eye at the outer corner in order that they may bathe the whole surface of the eye before they find

their way into the duct. Atropine, a preparation of belladonna, is used to dilate the pupil, and eserine to contract it. Homatropine is often used instead of atropine for the purpose of examination, as its effects pass off much more quickly. A solution of cocaine is dropped in to render the eye insensitive.

Ointment is introduced by means of a very small camel's hair brush, which is dipped into the ointment, and then laid along the eye just inside the lower lid, and drawn along and out at the outer corner. The same brush must not be used for two patients, and it must be carefully disinfected each time it is used.

Cotton-wool wrung out of boric acid lotion is used in place of sponges in eye operations; and the same is used for bathing the eye, instead of lint.

PART II

SURGICAL LECTURES

CHAPTER XIII

THIS first lecture will consider the structure and functions of the skeleton, and succeeding lectures will deal with the injuries and diseases to which it is liable.

Man belongs, in common with a large number of mammalia, birds, reptiles, and fishes, to what is known as the Vertebrate type of organisation.

This type is characterised by the possession of a long column or axis, composed of a number of bones or cartilaginous substitutes known as Vertebræ.

At one end of this is the head, at the other the tail, while on the sides of the main part, or trunk, project two symmetrical limbs.

The Vertebrate type is further distinguished by—

(1.) The existence on the dorsal side of the vertebral axis of a large cavity, containing the principal viscera.

The Skeleton is mainly formed of bones, but is completed in some of the joints by the addition of cartilage. Its uses are—

1. To afford support and attachment to the soft parts (muscles).

2. To afford protection to such parts as are particularly delicate. Thus the bones of the skull protect the brain.

3. The different parts of the skeleton being joined together movably, serve as levers for executing the various movements of the body.

The appearance of bone is familiar to everyone. It is hard, and to a certain extent brittle. Now if a piece of bone be care-

fully burnt, it will be found that the brittleness is much increased, and in fact it will readily crumble between finger and thumb. On the other hand, if a bone is soaked in acid, it loses its brittle character and can be bent without breaking. We learn therefore that bone is composed of two constituents—

1. **An earthy part**, which supplies the brittleness, and can be dissolved out by acids, leaving an

2. **Animal part**, which remains as a tough, flexible substance retaining the original structure of the bone.

The earthy matter constitutes about two-thirds of the whole. There is a disease known as mollities ossium, in which, by the absorption of the earthy material, the bones become flexible, and are readily bent or broken.

In addition to the bone substance proper, bones also present certain accessory soft parts. These are—

1. The **Periosteum**, an external fibrous covering.

2. The **Medulla**, or marrow, which fills the larger internal cavities.

3. **Blood vessels**, which permeate the bone, and also a few **lymphatics** and **nerves**.

4. Ends of bones, when jointed movably with one another, are covered with a thin layer of **cartilage**, forming a joint cavity.

5. In other cases, bones are directly united by means of **ligaments** without any joint cavity.

Outward form of bone.—Remembering the different uses of bone—viz. for support, protection, or leverage, we find they vary much in shape. They may be divided into four classes—

1. Long or cylindrical, such as the chief bones of the limbs. They are cylindrical or prismatic in shape; the extremities are thicker than the shaft, and have smooth cartilaginous surfaces for articulation. The shaft is generally hollow, and filled with marrow, by which means size and strength are obtained without increase of weight.

2. **Tabular or flat bones**, as those of the skull.

3. **Short bones**, more or less cubical or oblong, such as those of the wrist and foot.

4. **Irregular** or mixed bones, such as the vertebræ. We find

the bony structure occurring in two forms in the bones;—as a dense and closely arranged structure in **compact** bone, and as a spongy texture in **cancellous** bone.

The **spinal column** may be regarded as the central column upon which the other parts of the skeleton are arranged. It supports the skull **above**, the ribs **laterally**, through which it also receives the weight of the upper limbs, and **below** it transmits the weight of the body to the lower limbs.

It is composed of a series of twenty-four bones, fitted one on the top of another. Each bone presents a **body** and an **arch**, which encloses a central aperture. So that when all the vertebræ are put together, there is a long canal extending from the top to the bottom, and communicating above with the interior of the skull. This canal protects the spinal cord, which is a prolongation of nervous matter from the brain, and is so essential to life that paralysis or death follows any extensive injury to it.

Seven of the vertebræ belong to the **cervical** region, twelve to the **dorsal**, and five to the **lumbar**.

In addition to the functions of support and protection, the spine has the important property of **mobility**. It admits of movements backwards and forwards, and from side to side, and also allows of rotation. Whilst the amount of movement between any two vertebræ is comparatively small, that allowed by the whole column is considerable.

The movements of the body backwards and forwards are most fully allowed in the cervical and lumbar regions, least of all in the dorsal region.

Connections of the skeleton—

1. **Ligaments.**—The bones are so strongly bound together by ligaments that, as a rule, the bone gives way as the result of injury rather than the ligaments.

2. **Inter-vertebral discs.**—Between each pair of vertebræ is interposed an elastic disc, which is firmly connected with the vertebra above, and with that below it. These discs form together about a quarter of the total length of the vertebral column. The mobility of the column is largely due to these discs.

Curves of the spine.—The spinal column presents certain natural curves—

1. The cervical, with the convex forwards.
2. The dorsal, a long curve, with the concave forwards.
3. The lumbar, a short curve, with the convex forwards.

These curves are mostly due to the inter-vertebral discs, which are larger in front than behind in the cervical and lumbar regions.

The inter-vertebral discs and the curves obviously confer upon the spine greater elasticity and security from injury than would be the case if it were perfectly straight, as well as minimising the transmission of shocks and jars to the brain from the feet.

Inter-vertebral foramina. — Between each pair of adjoining vertebræ is a hole on each side, through which nerves pass out to be distributed to the various parts of the body.

Muscular co-operation.—It is important to bear this fact in mind, that in order that this column may be held in position, the active co-operation of a number of muscles is necessary. When from weakness of the muscles this fails, we find the back assuming certain curves, of which an example, familiar to all, is that known as lateral curvature.

Ribs.—Twelve pair of ribs are attached to the twelve dorsal vertebræ, increasing in length from above downwards, and then diminishing again. The first seven pairs of ribs are attached in front to the sternum. The ribs are movable.

Sacrum.—The spine rests below on a wedge-shaped bone, the sacrum, which is fixed in between the two hip bones or ossa innominata. These three bones together constitute the pelvis They are firmly knitted together, so as to allow of no movement whatever between them.

The rim of the pelvis may be distinctly felt, and is an important landmark in the anatomy of the body.

In the sitting posture the body rests on the two prominences, known as the **tuberosities of the ischium**. On each side is a deep cup, the acetabulum, in which the head of the thigh bone plays.

The **upper limb** consists of the shoulder, arm, fore-arm, and hand.

In the shoulder are two bones—

1. The scapula, or blade bone.
2. The clavicle, or collar bone.

The blade bone rests on the back of the chest, being connected with it by muscles only. One of its prominences, the acromion process, which forms the point of the shoulder, is attached to the outer end of the collar bone.

The collar bone is attached at its inner end to the sternum.

Notice the S-shaped curve of the shoulder, which is designed, as in the case of the spine, to minimise the effect of blows received on the point of the shoulder, or transmitted through the outstretched arm.

You see that the shoulder girdle is attached firmly to the rest of the skeleton at one point only—namely, where the collar bone is attached to the sternum. This is to allow of greater freedom of movement than would be allowed if the arm were attached to it at the shoulder joint. Thus, in abduction of the arm, when the possible range of movement has been reached at the shoulder joint, the movement may be continued by the raising of the shoulder-girdle by the muscles attached to it.

The upper arm contains one bone only—namely,

The **Humerus.**—It has a large hemispherical head fitting in a small oval-shaped cup in the scapula. This arrangement allows of very great range of movement, but it also renders it liable to dislocation. It is impossible to secure at the same time great mobility in the joint and perfect security against the head of the humerus being thrown out of its socket. But the bones are held in position by a loose capsule allowing of free movement, and provision is also made against dislocation by the attachments of the surrounding muscles.

The **Femur** in the lower limb may be compared with the humerus in the upper. The large head of the femur is lodged in a deep socket, where it is held by a strong round band of fibres passing from one joint surface to the other, as well as by the strong surrounding capsular ligaments and muscles.

The movements here are as various, but much more limited than at the shoulder, and dislocation is rare.

The shaft of the femur is larger and stronger than the humerus. Each bone is expanded below to form part of the hinge joints of the elbow and knee, in both of which there is practically movement in one direction only.

The forearm consists of the **Radius** and **Ulna**.

The **Radius** is large below, where it forms the most important part of the wrist, and it is small above, so that it shall not impede nor be impeded by the movements of the elbow. It has a capacity for rotation round the ulna, to allow of movements of pronation and supination, carrying the hand with it.

The **Ulna** is larger above, forming the main portion of the hinge joint of the elbow. It has no power of rotation. It forms the point of the elbow.

In the leg the **Tibia** and **Fibula** correspond with the radius and ulna. The tibia is the larger of the two, and expands above, to enter into the formation of the knee, from which the fibula, a long, round bone, is excluded. Below, however, the fibula enters into the ankle joint, and forms the outer malleolus.

The tibia and fibula are immovable one on the other.

The **Wrist joint** is that between the radius and ulna, and the eight bones which enter into what is known as the **carpus**. The movements here occur partly in the wrist-joint and partly in the carpal articulations. These movements are extensive, and allow of great freedom of movement in the hand—flexion, extension, abduction, and adduction.

In the **Ankle-joint**, however, the movements are limited to those of a hinge joint only—further movements of abduction and adduction being allowed by the joints between the tarsal bones.

The wrist bones, or **Carpus**, eight in number, present a hollow from side to side, in which the tendons and vessels and nerves are lodged as they pass to the hand. There are five metacarpal bones.

Each finger contains three phalanges, with the exception of the thumb, which has only two. There is extremely free movement and power in the thumb, and its metacarpal bone moves freely on the wrist.

The **Tarsus** or instep bones are seven in number, and with the

other bones of the foot arc arranged in the form of a double arch, one from side to side, and one from before backwards. This arrangement fulfils an important design, that of forming a spring on which the weight of the body is received.

This double arch rests on the firm basis of a tripod—viz. upon the heel behind, and the ball of the great toe and that of the little toe in front, an arrangement which excellently fulfils its purpose, when it is not spoilt by raising the back point of the tripod unnaturally (as is done by wearing a high-heeled boot), and thereby disturbing at once the spring of the arch and the centre of gravity. When the weight of the body is transmitted to the foot, as in walking, it is received upon this spring arch, which yields, and thus the shock is broken, and the jars which would otherwise be sustained by the body are greatly lessened. Thus this arrangement aids the arrangement of curves and discs of the vertebral column in preserving the brain from undue jolting.

When the arches of the foot are destroyed, a condition is set up known as **flat foot**, and everyone knows the inelastic character of the walk that accompanies this condition.

It remains now to consider the **skull**, which contains the bones of the cranium and of the face. The cavity in which the brain is lodged is mainly composed of four bones—the **Frontal**, **Occipital**, and two **Parietal**. In addition there is a **Temporal** bone on each side, and the **Sphenoid** at the base, and a smaller one, the **Ethmoid**. The front of the skull presents the orbital apertures, the nasal aperture, and the aperture for the buccal cavity (the mouth). The chief bones of the face are the **jaws**. The lower jaw is a single bone which moves in two sockets with the temporal bones.

With the exception of the lower jaw, all the bones of the skull are immovably united together.

CHAPTER XIV

JOINTS

THE articulation of a joint signifies the connection that exists in the skeleton between the bones and cartilages that form that joint. The way in which the various bones are joined together varies in a great degree, both in the nature of the uniting substances, and in the amount of movement they allow.

1. The presence of a joint between two bones does not necessarily imply the possibility of movement between them. In the bones of the cranium there is no perceptible movement, on account of the closeness with which they are fitted together, the unevenness of the fitting surfaces, and the small amount of substance which intervenes between them.

2. The next class of joints have the surfaces opposed to one another (not the edges only). They are connected by a larger amount of intervening substance, of the nature either of cartilage or ligament, and a certain amount of movement is allowed by the yielding or flexibility of this substance. The best example of this joint is seen in the vertebral column. The flat surfaces of the bodies of the vertebræ are connected by these elastic plates, which allow of considerable movement in the spinal column as a whole, though the amount of movement between any two vertebræ is but small.

3. In these two forms of joints, the opposed surfaces of bone are directly united to each other, but in the larger number of articulations the bone ends are free, and these form the third class of joints.

Each bone end entering into the joint is covered with a thin layer of smooth cartilage, the two surfaces fitting accurately together. They are held together by a capsule of fibrous tissue which surrounds them; and the joint is lined by a membrane

called the synovial membrane, which pours into the joint a lubricating fluid called the synovia.

In such joints the bone ends are capable of gliding or moving upon each other. The extent and directing of these movements depend on the shape of the opposed surfaces, and the attachment of the bands that surround them.

So the three classes of joints are—

1. Immovable joints.

2. Joints allowing of a certain amount of mobility, which is dependent on the flexibility of the substance which unites the bones.

3. Joints allowing of free mobility of the bones one upon another.

This third variety of joints is most important, from a nursing point of view, on account of its liability to accident and disease.

The parts of the joint are—

1. The bones entering into the articulation.

2. The cartilage covering the free ends.

3. The fibrous ligaments or bands constituting the capsule of the joint.

4. The synovial membrane, which is continuous with the margin of the articular cartilages, and with them completely encloses

5. The joint cavity, which is present only in the third class of joints.

In the case of the knee there are two cartilages of the shape of half moons placed between the bone ends. These are the semilunar cartilages, which occasionally cause trouble by being displaced.

The form of the different joints in this class of complete joints is associated with their movements, and we can classify them according to the movements, into the ball and socket joints, the hinge joints, the pivot joints, and the gliding joints.

The **ball and socket joint**, of which we have examples in the shoulder and hip joint, admits of a great variety of extent of movement. We have in the joint a rounded head, playing in a hollow or concave socket; in the case of the shoulder this socket

is quite shallow, and while this allows of great freedom of movement, it also renders this joint very liable to dislocation. In the case of the hip joint the cup is deeper, and dislocation is a rarity.

The **hinge joint**, as its name implies, allows of movement in one direction only. The elbow is a good example; its movements are flexion and extension only, no movement from side to side being possible. The ankle is another good example.

A pivot joint is one in which one bone furnishes an axis or pivot on which another bone turns; or one in which a bone turns on its own axis. An example of the former is afforded by the axis and atlas, the two uppermost vertebræ of the neck. The axis possesses a vertical peg, the odontoid process; the atlas is a ringlike bone, with a strong ligament extending across from side to side, which, together with the anterior part of the vertebra, furnishes a smaller ring in which the peg works.

A second kind of pivot is seen in the fore-arm. The upper end of the radius rotates in a ring formed partly by an articular surface on the ulna, partly by a strong ligament which surrounds the rest of the head of the bone.

At the lower end the radius moves round the ulna, and by the rotating movements allowed in these joints we get the pronation and supination of the hand. (The hand is "prone" when it lies on the palm, and "supine" when the palm is uppermost.)

The **gliding joint** has nearly flat surfaces, and admits of only a limited amount of gliding movement, as in the articulations of the wrist and foot.

The active power by which the joints are rendered movable resides in the *muscular tissue*.

The **Muscles**, which constitute what is commonly called the flesh of the body, are composed of a large number of fibres. These fibres are bound up by means of connective tissue into small bundles; and these bundles are again similarly bound up together, in various ways, so as to form muscles of various shapes and sizes. The characteristic property of muscle is that of contraction; it is known as muscular contractility.

This contraction consists in a shortening of the length of the muscles, and the shortening is accompanied by an increase in its thickness. The loss in length is counterbalanced by the increase in its thickness, and there is no actual increase in the size of the muscle.

The natural stimulus that produces contraction of a muscle resides in some portion of the nervous system, and this stimulus is conveyed to the muscles by means of the nerves. Some of the muscles, those of the limbs for instance, are under the control of the will, and we consequently speak of them as **voluntary muscles.** Others cannot be influenced by the will—for example, those forming the heart, and those which form part of the walls of the intestines and other viscera; these are called **involuntary muscles.**

A muscle, within certain bounds, increases in size according to its use; thus, any particular muscles, which are specially employed in some laborious occupation, grow larger, whilst muscles that are disused shrink and become smaller, as happens when a limb is kept at rest on account of a broken bone.

Shapes of muscles.—The many uses to which muscles are applied require that they should be of various forms. Thus some are broad and thin, as the muscles connecting the upper extremity and the trunk. Others form more or less elongated shapes, while others are cylindrical or spindle-shaped.

Tendons.—Most muscles have attached to them what are known as tendons, which consist of inelastic fibrous tissue. The tendons are arranged, according to the requirements of the particular muscle, into rounded bundles, which are sometimes of great length, or opened into expanded sheets.

The use of tendons is to form a convenient connection between a bulky muscle and the point it is designed to act upon. Thus, all the large muscles which act upon the hand and foot, terminate in these rounded fibrous bands, which occupy but a small space as they pass to their several destinations, even to the ends of the fingers and toes.

Levers.—In order to understand the action of the muscles upon the limbs, it is necessary to know a little about levers. By a lever we mean a rigid bar, one part of which is fixed while the

other is free to move. A familiar example, seen any day in the street, is that of a crowbar being used to raise a heavy weight. One end of the crowbar is placed beneath the weight to be lifted, and a little way from the end it rests on a small block. Now the point of the crowbar resting on the block represents the **fulcrum** or fixed point, and here the lever is supposed to be fixed, while at one end we have the weight to be raised, at the other the power applied to raise the weight.

So that in a lever we require—

1. A rigid bar.
2. A fixed point, or fulcrum.
3. The weight to be lifted, or resistance to be overcome.
4. The force, or moving power.

In the body the bones represent the rigid bar (1); the joints the fulcrum (2), or the fixed point about which the lever moves; and the muscles the active force (4); while the resistance (3) of course varies, being at times a weight to be lifted, and so on.

Levers vary according to the relative position of fulcrum, power, and resistance.

In the first form of lever the fulcrum is between the power and the resistance. An example of this is the triceps.

In the second form the fulcrum is at one end, and the power is between this and the resistance to be overcome. The biceps is an example.

In the third form the fulcrum is again at one end, but the resistance or weight is between the power and the fulcrum, as the muscle of the calf.

You will notice in these examples that the power is applied nearer to the fulcrum than to the resistance to be overcome. And though this implies a loss of power, it ensures great rapidity of movement. A small amount of movement at the short end of the lever means a rapid and wide movement at the other end.

Some of the Commoner Diseases of Joints

We have said that the synovial membrane normally pours out a lubricating fluid into the joint.

Now, under certain circumstances, this membrane becomes inflamed, and pours out an excessive quantity of fluid into the joint cavity, thus distending it to a greater or less degree, and giving rise to an obvious swelling of the joint. This affection is known as synovitis. As an acute affection we find it occurring usually as the result of blows, sprains, or other injuries inflicted on a joint. The condition of the joints in rheumatic fever, and occasionally in other fevers, especially in scarlet fever, may be regarded as identical. We all know what happens, when one gets a severe blow on the joint, or when one happens to twist it; the joint becomes swollen, red, hot, and painful—that is, we have the four cardinal symptoms of inflammation present.

This is due to inflammation of the synovial membrane, and effusion of fluid into the joint, and also, to a variable extent, to inflammatory exudation into the tissues outside the joint.

When a joint is inflamed you will find that a patient puts it into a certain position, which is that of the greatest ease. For instance, he flexes his knee instead of keeping it straight out; and it may be said of the other large joints, that when they are inflamed, they are kept in a flexed position. The hip joint, in addition to being flexed, is drawn away from the middle line of the body—that is, abducted, and is in addition rolled out a little. The reason of this is, that in these positions of greatest ease, the firm fibrous capsule surrounding the joint is most perfectly relaxed, the pain felt in acute distension of the joint being due to the stretching to which the capsule is subjected. So the patient relaxes the joint capsule as far as possible by assuming positions of flexion.

Acute synovitis may entirely clear up under appropriate treatment, but it may go on to a chronic form of inflammation, or pass into suppuration.

In some cases of **chronic synovitis** there may be very considerable distension of the joint cavity with fluid, and the synovial membrane is much thickened. In this form of inflammation the synovial membrane is the part of the joint mainly affected.

But there is another form of acute inflammation, known as **acute arthritis**, in which all the tissues of the joint are affected. This

form is attended by suppuration, and leads rapidly to disorganisation of the joint. This inflammation and suppuration are brought about by the entrance of organism into the joint, most often by means of a wound which enters the joint cavity, and the introduction of pus producing micro-organisms directly into the joint from outside.

In other cases, as in pyæmia, scarlet fever, and typhoid, the organisms are brought by the blood current to the joint (*i.e.* without any external wound).

In addition to all the signs of inflammation in the synovial membrane, the cartilages covering the end of the bone are destroyed, and the bones themselves become inflamed. The fibrous tissues forming the capsule of the joint are rapidly softened, and the joint cavity is filled with pus.

This is a very severe affection, and is attended usually with the most agonising pain. All the other signs of inflammation are present, and in a more marked degree than in synovitis; marked redness and heat, and swelling with much inflammatory exudation into the tissues around the joint.

Another symptom is what are known as **painful startings.** These occur when the patient falls asleep, and are brought about in this way.

The cartilages having been destroyed, the inflamed bone ends come into contact. When the patient is awake, he keeps his muscles rigidly contracted, and the ends firmly in contact. When he falls asleep, the muscles relax, and the bone ends rub together, with the result that he gets sudden violent spasms of the muscles, known as starting pains.

We next come to a more chronic form of inflammation, known as **tuberculous disease** of the joints, or commonly as **pulpy disease.** Examples of this disease in the knee and hip joints are constantly in the wards. It occurs most frequently in the young, and is chronic in its course.

Unlike the previous joint diseases, it begins, as a rule, very insidiously, often without much pain, and redness and heat in the joint are generally absent, at all events in the early stages. The joint becomes slowly larger in size, but instead of this being due

to the accumulation of fluid or pus in the joint, it is due to a very great thickening of the synovial membrane. It is this thickening that gives its name to the disease, for it is of a somewhat translucent, gelatinous, or pulpy character.

Sooner or later the cartilages become destroyed, and the bone ends are more or less eroded and worn away. The head of the femur may almost disappear.

In this form of disease, as in the others, the patient puts the limb into the position of greatest ease. The hip joint is flexed, abducted, and rolled out, and the knee joint is bent.

Finally, there is a very chronic form of disease known as rheumatoid arthritis. It progresses slowly for years and years, and leads to very great disablement.

The cartilages become worn away, and the bone ends themselves are gradually worn down, so that one limb may become much shorter than its fellow in course of time. Bony nodules are also formed round the edge of the bones, which interfere greatly with the freedom of movement.

In **treatment** of joint diseases generally **rest** is of the greatest moment. Whether the patient is to remain in bed, or whether he is allowed out of bed with the joint at rest in splints, depends upon the character and intensity of the inflammation. **Rest** is the first thing.

When the cartilages are destroyed and the inflamed bone ends are rubbing together, there is intense pain. To avoid this we make use of **extension**: in the lower limbs it is frequently applied by means of a stirrup extension apparatus. This extension is absolutely essential in cases of acute arthritis, to prevent the painful starting pains which will not let the patient sleep. In the more chronic tuberculous cases it also favours healing by preventing the rubbing of the bone ends.

Further, it is of great importance that the limb should be put up in such a position as will be most generally useful if the subsidence of inflammation is attended by stiffness, or **ankylosis** as it is called. Inflamed joints, it has already been said, are generally kept in a flexed position, but, in the case of the lower

limbs, it would never answer to keep the limb so, as it would be useless for walking; so the limb is straightened slowly, by degrees, by means of splints with only gradual extension (stirrup extension) with pulley and weight.

We therefore put the limb into such a position as will be of the greatest use afterwards to the patient, if the joint has unfortunately been rendered stiff when the inflammation has subsided.

Local remedies are sometimes applied—cold, heat, and blisters. But the three important parts of the treatment are—

Rest.
Extension.
Care as to Position.

CHAPTER XV

INFLAMMATION

INFLAMMATION may be defined as the immediate series of changes which occur in the tissues as the result of an injury, provided always that the injury is not of sufficient violence to destroy the tissues at once.

That is to say, whenever an injury is done to a part, a certain series of changes commences in that part, and forms up to a certain point what is known as the inflammatory process.

The causes of inflammation will be described later, but it may be mentioned here that injury to the tissues may result from some form of mechanical violence, as blows and wounds, or from the application of chemical substances, such as strong acids, or from the growth in the tissues of organisms which are known collectively as bacteria. Considering the variety of causes, it follows that inflammation varies much in degree, according to the intensity of the irritant and the length of time that it is acting on the tissues.

Phenomena of Inflammation.—The process of inflammation in early stages can be very well seen in the effect of a mustard poultice on the skin. If the poultice be removed in about ten minutes after application, the skin is seen to be reddened over the whole area to which the irritant was applied, but if the finger be placed on any part of the red area, the redness at once disappears beneath it. If, on the other hand, the poultice be allowed to remain on for an hour, it is found that the skin has become reddened, but that there are places from which the redness cannot be pressed away. Thirdly, if the poultice be left on for a still longer time, not only is there the redness which cannot be pressed away, but blisters have also formed on the surface.

The same sort of process may be seen in the case of slight forms of burns, or in other irritating applications to the skin.

In such an observation as the above, we see the whole series of changes which occur in the early stage of inflammation.

1. **Inflammatory hyperæmia.**—In this first stage the redness shows that there is an increased supply of blood to the part, and that the blood-vessels are dilated; and the fact that the redness can be dispelled by pressure shows that the blood is circulating freely.

2. **Stasis.**—In the second stage, where the redness cannot be entirely dispelled by pressure, it is evident that the circulation is no longer going on, but has been arrested. This condition is known as inflammatory stasis.

3. **Exudation.**—The third stage, where blisters have formed, implies that certain constituents of the blood have passed out and accumulated under the epidermis, thus forming a blister.

One can see exactly what takes place by studying the changes that follow irritation in a transparent membrane, such as a frog's foot.

Before proceeding further it is necessary to remember the terminal arrangements of the blood-vessels.

The large arteries divide and sub-divide, until they end in extremely small arteries called arterioles. These arterioles end in a network of small thin-walled channels called capillaries. An important property of the thin walls of the capillaries is that they are permeable to the fluid portion of the blood; the nourishment of the tissues is thus carried on by the free interchange of fluids between the blood in the vessels and the tissues outside them. The blood which has been brought to the capillaries is next collected from them by the small veins called venules, into which the capillaries enter.

If the web of the frog's foot be examined under the microscope, the capillaries may easily be seen, and the blood, containing a large number of red corpuscles and a few white corpuscles, circulating in the capillaries. If the area observed be irritated, the vessels in it may be seen to become dilated, and the blood in them flows with greater rapidity. This is the first stage, that of active hyperæmia, where the redness disappears on pressure. After a longer period of watching, it will be found

that the blood current becomes slower and slower, until finally, at the part where the irritation is most intense, it ceases altogether. This is the second stage, inflammatory stasis, in which the redness fails to disappear. The pressure of the finger is no longer enough to drive the blood out of the vessels. Now while these changes have been going on in the circulation of the blood, certain constituents of the blood have been passing out through the capillary walls. This is exudation. It has just been mentioned that in the healthy state there is constantly an interchange of fluids between the blood and the tissues through which the capillaries pass.

When inflamed fluids pass out in excess they give rise to a swelling or œdema of the part, and to the blisters which are noticed as the effect of the prolonged application of a mustard poultice to the skin. In addition to the fluids, the white corpuscles or leucocytes collect in the capillaries, first adhering to the walls, and then migrating through them into the tissues in considerable numbers, accumulating there. We also find a variable number of red corpuscles poured out into the tissues.

Leucocytes as scavengers.—The white corpuscles which have migrated from the blood have a definite duty to perform. They act the part of scavengers, in eating up and removing dead tissues, and at the same time they attack and destroy any micro-organisms that may be present, and then they themselves die, and are absorbed.

To recapitulate: first, there is a dilatation of the vessels with increased flow of blood, followed later by a stagnation of blood in the vessels, and the exudation into the surrounding parts of fluid and corpuscles, the white corpuscles acting as scavengers.

Symptoms.—We are now in a position to appreciate the symptoms that characterise inflammation. They may be divided into **local** and **general.**

The local symptoms are always described as four in number—namely, **redness, swelling, heat, and pain.** These four, when they occur together, always imply the presence of an inflammatory process. But when they occur separately they have not necessarily this significance.

The **redness** is due to the dilatation of the vessels of the part, and the increased flow of blood to it. This redness shades off gradually at the edge of the patch, and only occasionally, in certain specific inflammations, is there a thoroughly defined edge to the redness. The redness varies also according to the acuteness of the inflammation, being bright in the acute, and dark in the chronic variety. This deeper colour, in the more chronic forms of inflammation, is probably due to the escape of the red corpuscles from the blood-vessels when they become broken up and their pigment is deposited. This pigmentation often leads to discoloration which lasts for weeks, looking like that of a bruise.

An acutely inflamed part always gives the sensation of *greatly increased heat* to the hand when laid upon it; and also feels intensely burning to the patient himself. This again is mainly due to the increased blood supply to the part; and it is doubtful whether there is actually an increased production of heat in the inflamed area.

The **swelling** of the inflamed part is due to the exudation from the vessels. It varies a good deal in character, being sometimes *hard and brawny*, when it is not easy to press the finger into it; and at other times it is soft, and "pits" easily on pressure.

The swelling is always greatest where the tissues are most lax, as in the axilla, and is least in dense unyielding tissues, such as bone and tendon.

The situation of the inflammation, besides determining the amount of swelling, also determines the amount of pain felt. The pain is least when the inflammation occurs in loose cellular tissue, and greatest when it occurs in dense unyielding tissues, like bone, fasciæ, etc. It is due to stretching of or pressure upon the nerves of the part, which is caused partly by the distended vessels, and partly by the exudation.

Constitutional Symptoms.—In addition to the local symptoms there are general or constitutional symptoms, due to the absorption of poisonous materials from the area of inflammation.

These symptoms, which may be summed up as those of *fever*, vary in degree and character according to the nature and intensity of the inflammation.

Familiar examples can be seen any day in the hospital practice, varying from the slight feeling of illness associated with some trivial inflammation, such as one or two boils, to the very severe symptoms that accompany such affections as acute cellulitis or erysipelas.

There is a rise of temperature, quickened pulse, furred tongue, more or less complete loss of appetite, dry skin, constipation, and scanty high-coloured urine.

When the symptoms are acute, the temperature is high, 104 or 105°, and the pulse is full, strong, and bounding. This is sometimes called *sthenic* fever.

Occasionally the general symptoms assume a much more serious character, indicating very grave depression of the patient's vitality. Delirium of a muttering type is almost always present, the pulse is rapid, but is soft and compressible instead of bounding, and the tongue and lips become dry and brown. This is spoken of as *asthenic* fever, or sometimes it is called the "typhoid state," though it has nothing to do with typhoid *fever*.

Causation.—The exciting causes of inflammation may be grouped under three headings—

1. **Mechanical**, as injuries of all kinds following different forms of violence; burns may also come under this heading.

2. **Chemical.**—From the application of strong acids and alkalies, and many irritating substances, such as croton oil, mustard, etc.

3. **Micro-organisms**, the inflammation being due to the growth in the tissues of the various species of organisms known as bacteria.

If we consider these different causes, it will be seen that there is a further important distinction to be made, important especially from the point of view of the treatment to be adopted. For the inflammation set up by mechanical and chemical causes is limited to the area injured, and very rarely goes on to suppuration, unless micro-organisms are introduced. Moreover, mechanical injuries to the tissues are usually momentary in action, or of short duration only. And the cause of the inflammation may be regarded as easy to get rid of—*e.g.* after the mustard poultice is

removed, the irritant action no longer persists, and the inflammation subsides. Whereas, when we consider micro-organisms as a cause of inflammation, the conditions are quite different.

In this case we have the organisms *growing* in the tissues and spreading in them; and, as they spread, so does the inflammatory reaction spread. So the inflammation set up by organisms is to be regarded, in many instances at least, as a *spreading inflammation*—for example, erysipelas. Further, the formation of matter, or *pus*, is a frequent result, and indeed for all practical purposes we may consider that pus is invariably dependent upon infection of the tissues with certain forms of bacteria. And also, the cause is *not readily removable.* When micro-organisms have got into the tissues, it is not easy to remove them. In some cases you will see in the wards, such as anthrax or malignant pustule, the area of skin surrounding the growing organisms is cut clean away. But in other cases we have to rely on the natural resistance of the body, and perhaps on such measures as the application of heat or cold, or on free incisions.

The Terminations of Inflammation

1. The inflammation may come to a standstill, and the parts inflamed may be restored to a normal condition; in other words *resolution* occurs. By resolution, therefore, we mean the complete restoration of the part to its normal condition. The walls of the blood-vessels recover, the stagnation of blood passes off, and the circulation is restored, whilst exuded materials become re-absorbed.

2. If the inflammation be extremely violent, so that stasis or stagnation of the blood occurs over a wide area, when the inflammation comes to a standstill, a portion of that area does not recover, and we have the condition of *gangrene*—that is, the death of a visible portion of tissue. When the death of tissue is limited to a small portion, say of the skin, the process is spoken of as *sloughing*, and the dead piece is a *slough*. In the same way, a portion of bone dying *en masse* is spoken of as a *sequestrum*.

3. When the inflammation has gone beyond the stage when

resolution is possible, granulation tissue is formed, which itself may become hardened into *fibrous tissue*, or may produce an abscess.

4. When the inflammatory tissue breaks down and forms *pus*, the process is known as *suppuration*. The character of pus is well known, as a creamy, yellowish white fluid.

(*a*.) Now this pus may be contained in a cavity with a more or less defined wall. This is an *abscess*.

(*b*.) Or, on the other hand, it may infiltrate the tissues without being circumscribed in any way. This is *acute cellulitis*.

5. When the liquefaction of inflammatory tissue occurs on a free surface, such as the skin, it is *ulceration*. The process is identical with the preceding.

6. Finally, an acute inflammation may pass into a *chronic stage*.

CHAPTER XVI

FRACTURES

IT is unnecessary to consider every variety of fracture of every bone in detail, but it is useful for a nurse to know something of their mode of causation, their varieties, and the lines of treatment in common use.

This lecture will, therefore, consider mainly general principles; and such points as would lead a nurse, on the one hand, to avoid doing further damage to the injured parts, and, on the other hand, to appreciate the treatment adopted in any individual case.

In medical language a fracture is defined as "a solution of continuity in a bone, suddenly made."

Causation.—The most common cause is some form of

1. External violence. This may be divided into—

(*a.*) **Direct violence**, as when the bone is broken at the spot where the violence is applied—*e.g.* a kick on the shin.

(*b.*) **Indirect violence**, where the fracture occurs at some part at a distance from the point of application of the injury. The bone snaps at its weakest part, the force being applied at one end while the other end is fixed—*e.g.* a fractured clavicle, caused by a fall on the hand.

A less common mode of fracture is by

2. **Muscular violence**—a sudden and violent contraction of a muscle causing the bone into which it is inserted to break—*e.g.* fractured patella.

Lastly, there is a group of cases in which the bone breaks as the result of what would ordinarily be a totally inadequate cause.

3. **Spontaneous fracture.**—In many of these cases the bone is weakened by inflammation or growth at a certain part; in other cases the bones are atrophied as the result of old age or prolonged rest in splints or in bed.

Varieties.—Fractures may be divided into—

(1.) **Simple**, when the skin covering is unbroken.

(2.) **Compound**, when a wound leads down through the skin and soft parts to the seat of fracture. Now this wound is sometimes caused by the same violence that caused the fracture, but it is important to remember that sometimes a simple fracture is made compound secondarily by movements of the patient or by the careless handling of those about him. More will be said on this point later.

According to the *extent* of the fracture, they may be divided into—

1. Complete.
2. Incomplete or greenstick, partly broken and partly bent.
3. Comminuted, broken into several pieces.

And according to the *direction* of the fracture, into

1. Transverse, broken straight across.
2. Oblique, in a slanting direction.
3. Longitudinal, in the length of the bone.

Repair or union of a fracture is brought about by the formation round the broken ends of a mass of new bone called *callus*. In this the ends are embedded. The time required for union varies a good deal according to the size of the bone, from two or three weeks for the bones of the fingers, to ten or twelve weeks for fracture of the femur.

Union takes place as follows:—

1. Blood is extravasated between the broken fragments.
2. And replaced by red soft granulation tissue.

(*a*.) This forms a spindle-shaped tumour above and below the line of fracture, called the *ensheathing* callus.

(*b*.) It also replaces the marrow, *internal* callus,

(*c*.) And forms between the ends of the bone the *intermediate* callus.

The callus is gradually converted into bone.

There is a greater amount of external callus when the bones are not in good opposition ("badly set"), and when it is impossible to keep them at rest, as in a fractured rib.

The clavicle takes about three weeks to unite after a fracture, the tibia about four weeks, and the femur six; but it is

six months before a bone is as perfect as it was before the injury.

Injury to soft parts.—In addition to the injury to the bone, it is important to bear in mind that there is a considerable amount of injury to the soft parts, such as the muscles surrounding the fracture, and this is not always very evident on an outside examination. Remember, however, that more or less bruising and laceration of the muscles and other soft parts is always present.

Now, though this may be due in part to the violence that caused the fracture in those cases where the violence is direct, when the injury is indirect, it is caused by the working about of the sharp broken ends of bone. Not only may the muscles be injured in this way, but the arteries and veins may be lacerated, and the nerves torn through. The importance of this is obvious from the point of view of treatment.

Signs of Fracture

1. **Pain and tenderness.**—These by themselves are of course valueless, for so many other causes produce them. They serve, however, to locate the position of a fracture; and, in the case of ribs that have been broken by *indirect* violence, they may be the only symptoms that render the existence of a fracture recognisable.

2. **Loss of power**, more or less complete, naturally results when a part is deprived of its rigid support.

3. **Deformity of the part.**—This may be due in part to extravasation of blood and to inflammatory exudation. The most important is that resulting from displacement of the fragments. It is most obvious in the case of the long bones. It may appear as—

(*a.*) **Shortening** of a part, as in the thigh.

(*b.*) Associated with this is **increase in girth**, from approximation of the ends of the muscles, and their consequent thickening, from the overlapping bones, and from the extravasated blood.

(*c.*) **Angular deformity.**

(*d.*) **Rotatory deformity**, observed in fractures of the thigh and of the leg, the lower part of the limb being rolled outwards.

4. **Abnormal mobility**, which is a certain sign of fracture.

5. **Crepitus**, the grating of one broken surface against another. Do not attempt to elicit this sign for yourself; it may sometimes be noticed when moving the patient into bed, or during the removal of his clothing.

Mal-union or non-union.—It occasionally happens that, instead of the bone uniting in a good position, for some reason or other, perhaps unavoidable, the fragments become united in a bad position, a condition to which the term mal-union is given.

At other times they fail to unite by bone.

1. Under these circumstances you may find *no union* at all (non-union), the ends being rounded off.

2. Or more commonly the ends are connected by fibrous tissue (fibrous union).

3. And occasionally one has a joint formed between the two ends (false joint).

The treatment of fractures, as far as it concerns their nursing, may be noted under the following heads:—

1. **First aid**, by which we mean the adoption of some improvised support or splint to prevent further injury.

2. **Precautions** to be taken in transport.

3. **The arrangement of the bed**, and getting the patient into it.

4. **Deliberate treatment**, including the setting of the fracture and the adoption of some form of permanent splint.

With regard to first aid, remember what was said above about the injury to muscles and soft parts by the sharp fragments of bone. Now, it is obvious that movements on the part of the patient, or rough handling by those about him, will greatly increase the damage already done, and may even convert a simple fracture into a compound, by causing a sharp end of bone to perforate through the skin. This is not so very uncommon, and the same rough treatment may also lacerate vessels and nerves with serious results. Some means, therefore, must be adopted to prevent further injury during the removal to hospital or elsewhere. These remarks apply especially to the leg, and, above all, to the thigh.

If it be *necessary* to raise a patient before any support can be

applied, it should be borne in mind that the *form of the limb must be steadily preserved.* One person should attend solely to the fractured part, and carefully prevent any displacement. A foot or leg should not be allowed to hang down. An assistant should stand on the outer side of the limb, holding it firmly, with slight extending force, above and below the fracture.

For the purpose of **improvised splinting**, anything that comes to hand should be made use of—broomsticks, firewood, sticks, umbrellas, book covers, brown paper, newspapers, corrugated paper. Very useful splints may be made of the latter, if folded sufficiently. These improvised splints may be tied on with handkerchiefs, towels, etc. In the case of fracture of the lower limb, the sound limb may be brought into requisition as a splint, the damaged leg being firmly bandaged to the sound one, after the application of the temporary splints.

As a rule, the removal of clothes is unwise, until just as the patient is about to be put into bed, when it can be done deliberately, and with the causation of as little pain and damage to the injured parts as possible.

Means of transport must be found. Most patients, after a fracture of the upper limb, can walk, supporting the injured limb with the other hand, or having the fore-arm more or less supported with a handkerchief.

But those with fracture of the lower limbs must be carried on a stretcher of some description, or, as in the case of many patients we see daily, brought up lying flat in the bottom of a van. Neither a cab nor a hansom should be made use of for such a fracture as that of the thigh, and, even in cases of fracture of the leg bones only, they are awkward conveyances, on account of the difficulty the patient has in getting in and out of them.

Exposure to cold must be carefully avoided after an accident. Wrap up the patient well, for after a shock his heart beats with less force, and he is likely to be cold.

The essential qualities a **fracture-bed** should possess are, that there should be no "sagging" or possibility of giving way, that the surface should be quite smooth and comfortably elastic, and, in some cases, that the foot should be a little higher than the head.

Spring-beds do not fulfil these requirements, nor beds of sacking, for they give way in the middle, and form a hollow under the patient. All that is required to make an ordinary bedstead into a fracture-bed, is to place a few deal boards across the framework of the bed, under a firm mattress. Flock-beds are less desirable than mattresses, and feather-beds are not permissible. A single bed should be used in private nursing, one that is about the dimensions of a hospital bedstead.

The patient may be undressed either on the stretcher or on the bed, but by choice on the latter. The sound arm or leg should first be removed from the sleeve or trousers. Put the patient to bed in the same way that he was originally put on the stretcher, unless the limb is already on a splint. If it is placed in an improvised splint, the splint may be removed when the patient is in bed, and the limb put on a pillow and steadied with sand-bags, the weight of the clothes being kept off by a cradle.

"Setting"—"Splinting."—The limb having been "set," as it is called—that is, the deformity due to displacement having been removed as far as possible, the limb is fixed up in some position to maintain the fragments in position.

There are **rigid** splints, and splints **moulded** to the limb in some plastic material.

The first are of some fixed form and shape, and of some rigid material, as iron or wood, to which the limb may be attached by bandages and strapping.

The second are moulded to the injured or diseased parts, to give them the needed support. They have the property of being soft when applied, and then of setting or hardening.

In the rigid splints we have such forms as the plain straight wooden ones, simple angular splints, or more complicated ones of metal, such as MacIntyre's splint.

All splints before being applied should be padded. Metal splints are sometimes padded with elephant plaster, but in most cases the splints are covered with pads made of tow and covered with linen.

Moulded splints are made either of leather, gutta-percha, and felt, or of bandages, house flannel, etc., which have been dipped

in plaster of Paris, or less often, in silicate of potash, starch, gum, and chalk. These are known as Croft's, Bavarians, etc.

Indications for removal of a splint.—The points that a nurse should attend to in a case of fracture where splints have been applied, and that may indicate need for their removal, are the following—

1. **Pain**, if considerable. It is often felt at the heel when a back splint is applied to the leg, and is often caused by the strapping cutting into the skin.

2. Signs of **obstructed circulation**, such as swelling in the parts enclosed in the splint, with numbness, discoloration, and coldness. All these should be looked for, more especially when a Croft is applied to the lower limb. The limb will sometimes swell after the splint has been applied, and in this way the circulation is impaired, or a piece of strapping or bandage may have been applied so as to constrict the limb tightly.

It is important, therefore, that some portion of the limb should be visible, such as the fingers or toes, and that they should be inspected from time to time after the splint has been applied.

CHAPTER XVII

HIP DISEASE

TUBERCULOUS disease of the hip joint is an affection that nurses have an opportunity of seeing almost daily in the hospital ward; this chapter will deal with it as a common instance of joint disease, supposing that the patient is a child.

If the affection of the joint is at all acute, the first thing you notice is, that on moving the child for the purpose of undressing and washing him, he cries out with pain. And he will refer the pain to the neighbourhood of the hip joint. *Pain* is, therefore, the first symptom to notice, *situated at the seat of disease.*

You will find in some cases of a more chronic character that the child complains of pain rather in the knee than in the hip joint, and it is not at all uncommon to have a child brought up for something the matter with its knee joint, when really the hip is at fault. That is, pain is not felt at the exact seat of disease, but at a distance from it.

This fact is explained as follows. Pain occurs in the course of the nerves, and is dependent on their connection with the central nervous system; and when nerves are cut across or destroyed by disease no pain is felt in those parts to which the nerves are distributed. For instance, when the spine is fractured and the spinal cord crushed, there is no sensation and no pain felt in those parts which lie below the level of the crushed cord, and the same thing is sometimes seen as the result of disease of the cord or nerves. So that we have to look for an explanation of this curious fact of the transference of the pain to the knee joint, to the arrangement of the nerves going to the part. We find that both joints are supplied by branches from the same nerve, and that the pain, instead of being felt in the nerves at the seat of disease, is "referred" to a branch at a distance. Examples of this "referred pain" are not infrequent.

A very common instance of referred pain is the stomach-ache that children complain of when suffering from diseased spine. There the pain is not complained of at the site of disease, but is felt at a distance, in the course and distribution of those nerves which pass by the diseased spine, and which are themselves inflamed by the disease surrounding them. Another example of referred pain is the headache caused by decayed teeth.

2. Secondly, you will find that attempts at movement increase the pain, so that the child holds the joint more or less rigidly. If there is perfect movement in all directions, there can be nothing wrong in the joint itself, in spite of the pain; and the stiffness may be due at first, not to the joint but to the muscles above the joint, which contract, in order to keep the joint in the position of greatest ease.

3. The attitude in hip disease is very characteristic. The inflamed joint is generally held in a flexed position, abducted and rotated outwards; so that if you see a child lying in bed in this position, you can recognise it as most probably a case of hip disease. But the child may tilt the pelvis in such a way as to bring the legs into parallel lines, and so get rid of the flexing. He manages it by arching his back so that there is a hollow underneath it. This arching is known as lordosis. The adduction can be got rid of by tilting the pelvis, so that one hip is higher than the other, and the legs are again straight in bed.

4. **Abscess.**—In all disease of the joints there are the usual signs of inflammation—redness, swelling, and heat, though these signs are less conspicuous in the hip than in other affected joints; but severe pain is a constant symptom in every case. With proper rest and treatment the inflammation may clear up; but if it is not taken in time, or if remedies are of no avail, the inflammation goes on to abscess. The pain continues and increases, there is no sign of resolution; and granulation tissue begins to form in the joint. This granulation tissue wears away some part of the joint. In some cases of hip disease the synovial membrane alone is affected, but more often the cartilage is worn away as well, and the bone destroyed to a certain extent, the place of all these structures being taken by granulation tissue. Then the

granulation tissue breaks down, and becomes pus, and an abscess is formed. This pus may make its way to the surface and the abscess is opened, or it may pass through tortuous passages forming sinuses, or burrowing tracks, through which the pus passes along the tissues to the surface.

But the granulation tissue, instead of becoming pus, may form fibrous tissue, or even bone, and this is the most usual method of repair in cases of tuberculous disease of the hip joint. The inflammation clears up sooner or later, and the fibrous tissue unites the two ends of the affected bones so firmly together, that it takes the place of a joint. It occasionally happens that the fibrous tissue, being converted into bone, fills up the cavity where the joint was destroyed, and makes the two bones into one. This result, however, more often follows disease of the spinal column than of the hip. Of course, there is no movement in a joint formed by this bony union, or ankylosis; the joint is quite stiff, but this stiffness must not be confused with the early stiffness of muscular contraction.

While this bony union is forming, the joint must be prevented from separating, and, as it stiffens, it must be fixed in the position in which it will be of most use to the patient. This is done by means of splints, bandages, etc. The leg should be kept in an extended position on the bed, until it is rigidly fixed. Joints require to be fixed in different ways; for, while rigidity is essential in the knee and ankle, it is less necessary in the wrist and elbow than is the power of movement.

Whenever the tissues are inflamed or injured, the most important treatment is rest. And in hip disease the two chief principles of treatment are—

Rest and Extension

1. **Rest.**—If the disease is at all acute, there must be absolute rest in bed, the patient not being allowed to sit up in bed nor to get out for any purpose. In a less acute case he may be allowed to get up, but the affected joint must be kept perfectly at rest by means of a splint, such as a Thomas's hip splint. This is an

upright piece of iron, moulded to the curves of the body, with three cross pieces, one of which grasps the chest, the second the thigh, and the third the leg below the knee; the leg is thus kept perfectly stiff and straight, and no movement should be possible in the hip joint. When the patient is allowed to walk about, he wears on his sound leg a boot with a high patten on it, in order that the diseased leg shall be kept off the ground, and be prevented from bearing any weight. The splint itself is prepared for use by being padded with cotton-wool covered with wash-leather, and straps and buckles are attached to the three cross pieces, to fasten them round the body and leg. For the sake of cleanliness, it is better to cover the wash-leather with a bandage, which can be taken off and renewed from time to time.

2. **Extension.**—This is applied gradually at first, to overcome the bad position which the leg has assumed. This may be done by means of a splint, which is straightened by degrees; but the more usual and the better way is by means of a weight and extension. The object of the extension is to overcome the pull of the muscles which draw the leg upwards, and thus to keep the two inflamed bone ends apart. It is the rubbing of these two ends which causes the agony of hip disease, and the sharp starts of pain and the cry which is characteristic of it. While the patient is awake, he unconsciously keeps the muscles which extend the hip bone well contracted, so that the inflamed surfaces do not come into contact, then, as he drops off to sleep, the muscles relax, the bones come together, and he wakes crying out with the sharp pain. After the weight and extension have been put on, he loses this pain.

The materials needed for an extension are wide, strong sticking-plaster (strapping), narrower plaster in pieces a little longer than the circumference of the leg, and a stirrup, or square piece of wood the same width as that of the foot at the ankle, with a hole in the middle, through which a knotted cord is passed. The piece of wide strapping must extend from the middle of the outside of the thigh to about four inches below the foot, and up again the other side. The "stirrup" is fixed to the strapping below the foot, and the short pieces of strapping are put on round

the leg, from the ankle to below the knee. They must overlap each other by about half their width, and two or three pieces must be put on above the knee. The strapping should be left for several hours to get firm before the weight is hung on to the cord, which should pass over a pulley fixed to the foot-board of the bed. The strapping is taken right above the knee, to avoid the ill effects of pulling at a sound joint. Care must be taken that the stirrup is wide enough to prevent the strapping from rubbing the ankle and causing a sore. The foot of the bed has to be raised on blocks, so that the weight of the body shall pull in the opposite direction, else the child may be pulled by degrees to the bottom of the bed, and the weight will be found resting on the floor.

A double Bryant's splint is often used in hip disease. Instead of a leaden weight, a strong piece of indiarubber supplies the pull. It is a very convenient splint, from a nursing point of view, as it is easy to turn the patient on his side, or to lift a child from one bed to another, when he is firmly bandaged into it.

Spinal Caries.—Pott's disease, or angular curvature of the spine, is a good example of tuberculous disease of the bone. It is serious, on account of the important structure in which the disease occurs, and on account of the proximity of the spinal cord.

The disease is tuberculous, like the hip disease that has just been spoken of—that is, it is caused by the entry into the tissues of the tubercle bacillus, which excites the characteristic inflammation that has been described. This tubercle bacillus is the same organism that produces phthisis and many other diseases.

It finds its way to the body of a vertebra, and gives rise there to granulation tissue, which gradually destroys the bone, as in the case of the hip joint, eating away the bodies of one or two vertebræ. The result is, that the weight of the body, transmitted through the spinal column, causes the vertebræ above to sink down on the vertebræ below those that have been partly destroyed, and thus pushing the arches of the affected vertebræ outwards, produce the curvature. The arch of the vertebræ, which protects the spinal column, is displaced more and more as the disease progresses.

When the deformity appears, the diagnosis of spinal caries is clear; but before there is any obvious deformity there are symptoms which point to spinal disease.

1. The first symptom is **Pain**. There may be local pain and tenderness over the site of the disease, but more often there is no pain nor tenderness in the immediate neighbourhood of the diseased bone, the pain being referred to the ribs or the abdominal region, and the patient complains of neuralgia, indigestion, etc., or he may have pain at the back of his head, or shooting down the arms or legs.

The reason for this referred pain is, that nerves feel pain at their extremities, and not at the spot where they are injured. The abscess of the spine presses on the roots of the nerves as they issue on each side of the spinal column, but the pain is always felt most, if not entirely, at the final distribution of the branches of the nerve. "Referred pain" is seen more clearly in disease of the spine than in any other form of disease.

If, as sometimes happens, there is no pain in spinal disease, it is because the abscess is not near the nerve roots, but is all in front of the cord, or at the sides, or in some position where it does not compress the nerve.

2. There is **rigidity** of the spine. The child is noticed to avoid moving his back; he will bend anything but his back when he wants, for instance, to pick up anything from the floor. This rigidity is due to the contraction of the muscles of the back, which keep it steady, and prevent any movement of the spinal column, which would cause pain in the inflamed parts.

3. **Deformity** is due to the destruction of the bodies of the vertebræ.

4. **Abscess.**—The pus often travels a long distance before it "points," or comes to the surface. It may pass from the affected vertebra down in front of the spine into the iliac fossa, and point in the inner part of the thigh, when it is known as a psoas abscess.

5. **Paralysis.**—The inflammatory material is sometimes thrown out into the spinal canal, and the granulation tissue or pus compresses the spinal cord, so that it is narrowed to much less than

its ordinary size; it becomes inflamed, and the parts of the body below the disease become paralysed. This is known as compression paraplegia. It is not due to kinking of the cord, although the spinal cord is very much bent at the curvature, but it is a consequence of the inflammatory material inside the spinal canal which presses on the cord.

The treatment for spinal caries, as for hip disease, is rest. At first the patient must be entirely in bed; but, when he has improved to some extent, he may wear a jacket as an artificial support, to keep some of the weight of the head and upper part of the body off the diseased part. It is generally made of plaster of Paris, felt, or leather, or poroplastic felt, closely moulded to the shape of the body while the patient is suspended by the head and shoulders. Extension is used as an occasional treatment, the body being fixed, and extension applied to the head by means of straps.

CHAPTER XVIII

WOUNDS

IN considering the treatment of wounds they may be regarded as consisting of four classes—

Incised, or clean cut, as an operation wound, or a cut throat.

Lacerated, where the surface and edges of the wound are irregularly torn, as in an accident from machinery.

Contused, where the parts affected are injured as well as divided, as in a wound inflicted by a heavy blunt instrument.

Punctured, as in a stiletto wound, where the depth of the wound may lead to internal hæmorrhage, or to injury of one of the vital organs.

Accidental wounds differ from those made intentionally by a surgeon in a very important particular—viz. they are made probably by a dirty instrument, which introduces septic matter into the wound, and are certainly made on an unprepared skin. An accidental wound is therefore likely to suppurate, unless it is carefully cleansed with antiseptic lotions.

When the skin is much torn, as in lacerated wounds, severe inflammation, with destruction and sloughing of the skin and tissues, will probably follow; but the hæmorrhage is less than in the case of clean cut wounds, because the vessels have been torn across rather than cut, and arteries have the property of contracting their torn ends, so preventing the loss of blood, but there is generally a good deal of effusion of blood into the tissues.

The power of repair in wounds depends on the amount of damage that has been done to the tissues, and it varies according to whether organisms have or have not entered the wound.

Primary Union, or healing by first intention. When a tissue is injured, a certain series of changes supervene, that we speak of as inflammation. So when a wound is inflicted, say by a knife, the process of inflammation follows, as was described in a previous

chapter. There is first dilatation of the blood-vessels, then stagnation of the blood current, with exudation of the fluid parts of the blood, the liquor sanguinis and corpuscles. This exuded material, called lymph, covers the surface of the wound in the course of a few hours. The lymph glues the cut surfaces together, provided that they are closely in contact, and have been made clear of all foreign material, such as blood clot. The inflammation ceases, unless it is kept up by the entry of organisms or other cause, and healing commences. Cells from the vessels and the neighbouring tissues enter the lymph, and are converted into fibrous tissue, which firmly binds the surfaces together.

It is the surgeon's aim, in most cases, to ensure this form of healing. The line of fibrous tissue remains in the skin as a permanent scar.

Healing by granulation.—It is necessary for primary union that the surfaces of the wound shall be clean cut and in contact with each other. Now, in some wounds, either occurring accidentally or made by the surgeon, some amount of tissue has been removed, and the edges and surfaces are not in contact. And in some other cases, as in lacerated wounds, though the edges may be in tolerably good contact, there is so much destruction and sloughing of the tissues that the surfaces cannot heal together. Again, want of rest, or the entry of an infective organism, may prevent healing by first intention.

These wounds will pass through the process known as *healing by granulation.* Suppose that a portion of skin and the underlying tissue has been removed by the surgeon, the same inflammatory process will be seen as in the case of the wound healed by first intention—viz. the raw surface becomes coated with lymph. The lymph is soon replaced by granulation tissue; little red projections are visible over the whole surface, and these granulations go on increasing in size until by degrees the whole wound is filled up. As the granulation tissue reaches the surface, the skin grows in from the cut edges, and extends over the granulating surface, which itself duly is converted into fibrous tissue.

The scar is red at first, owing to the number of new vessels in it, but it becomes whiter, until it is paler than the surrounding

skin; because, as the scar tissue contracts, the new vessels are squeezed up and disappear.

In a wound healing by first intention the process is much quicker than in a granulating wound, and the resulting scar is much less disfiguring; indeed, it almost disappears in the course of time.

There are many causes which hinder primary union—

1. Contusion and laceration of the edges of the wound, causing sloughing of the tissues around it.

2. The presence of a septic foreign body within the wound, such as a shred of clothing, or dirt, or part of the instrument inflicting the wound.

3. Bad condition of the patient, such as that due to drink, diabetes, etc.

4. Want of rest to the wound.

5. Inefficient drainage of the wound.

6. Neglect of antiseptic precautions, which leads to suppuration.

Some of these causes of failure in union are beyond the surgeon's power to prevent, but others he can obviate with proper precautions.

Primary union is not always to be expected in accidental wounds, owing to the destruction of the tissues around them; and it is most likely that dirt or foreign bodies entered the wound at the instant it was made, which lead to suppuration. The first treatment of a wound is to make it as aseptic as possible. It is not to be examined with dirty fingers or probes, nor to be cleansed with any water that is handy, regardless of its possible contamination. Yet, in cleansing a wound, the thoroughness of the process is of more importance than the fluid with which it is done. After the cleansing is done, the wound may be sewn up if it is cleanly cut; but in any case of doubt as to its surgical cleanliness it is better to leave it open, and pack it with gauze.

The fluids generally used in cleaning wounds are—

Carbolic acid 1-20 to 1-40.
Perchloride of mercury 1-1000 to 1-4000.
Lysol 1-50

Surgical wounds.—The chief hindrance to primary union in

these cases is the *growth of micro-organisms* in the wound, leading to suppuration. Suppuration is always due to the presence of certain organisms, chief among which are what are called *pyogenic micrococci*—Staphylococci and Streptococci.

These may reach the wound (1) by means of the blood-current, or (2) the air may carry infective particles with the dust falling on an uncovered wound, or (3) the hands or instruments of the operator may convey them.

The blood current rarely carries infection, as is shown by the fact that injuries in which the skin is unbroken do not go on to suppuration, except in very rare cases.

Recent observations show that there is but little danger of infection from the atmosphere, so it is clear that the great majority of suppurating wounds are caused by want of surgical cleanliness in the instruments used at the operation, the hands of the operator or his assistants, the materials used for dressing the wound, or in the skin surrounding the wound. Any of these may introduce organisms directly into the wound.

The surgeon's aim is therefore—

1. To secure the absence of organisms from the wound.

2. To keep the wound at rest.—The wound is closed by the edges being carefully brought together and united by sutures of various kinds—silk, catgut, etc.; and it is rendered incapable of movement by a splint or other support, bandages, strapping, etc. As far as nursing is concerned, it is necessary to keep the part that is wounded at rest, but this does not always involve keeping the patient entirely in bed.

3. To ensure proper drainage.—Surgeons differ very much as to the use of drainage, some employing it much more largely than others, and they vary much as to the length of time for which it is used. Amputation wounds are frequently drained for the first day or two.

Gauze and catgut are used for drains, and indiarubber tubes of various sizes, in which holes have been cut at the sides. Free drainage is employed in suppurating wounds, such as a spinal abscess.

Thirty or forty years ago, when the cause of infection of wounds was unknown, the suppuration of wounds was the rule rather than the exception, and such diseases as erysipelas, cellulitis, tetanus, and hospital gangrene commonly followed an operation done within hospital walls. When the patient operated on escaped with his life, he was twice as many months in getting about his work again as he now is weeks. This was not for want of skill in the surgeon, but for want of knowledge of the process of infection.

Nowadays, when this process is thoroughly understood, it is certain that if a wound suppurates, some one is to blame. Either the patient's skin was dirty, or the hands or instruments touching the wound contained infectious material, or the dressings were not surgically clean.

The micro-organisms can be got rid of in two ways—

1. By heat.
2. By various chemical substances.

Most of the bacteria are easily destroyed by boiling, and boiling is the simplest method of sterilising instruments and such appliances as will not be injured by the process. But it is inapplicable to the patient's skin, or the operator's hands, and various chemical substances are used for destroying the bacteria there; 1-in-20 carbolic acid, and 1-in-1000 perchloride of mercury will destroy them in a few minutes. Everything coming in contact with the wound must be sterilised by one of these two methods—viz. by heat, or by chemicals.

But the wound may already be suppurating when it comes into the surgeon's hands. It has then to be considered how to prevent the multiplication of the bacteria. Now moisture is one of the essentials for their growth, so that they are more likely to be kept in check if the moisture from the wound is carried off by means of drainage, and absorbed by such dressings as dry gauze and wool. Some of the fluid is evaporated from the surface of these porous dressings, and there is less left in the wound to act as nutriment for the bacteria.

Some of the bacteria are also destroyed by the use of antiseptic lotions, and the continued use of antiseptic dressings. And it is

also known that the living tissues themselves have some amount of power to resist the extension of organisms.

The preparations for an aseptic operation include the cleansing of—

1. The room.
2. The patient's skin.
3. The instruments and dressings.
4. The hands that will touch anything that is near the wound.

The room should be cleaned the day before, as thoroughly as possible, and only a damp cloth should be used for dusting on the day of operation, that there may be as little dust as possible in the air of the room.

The skin is cleansed by shaving, rubbing with turpentine if the surface is very dirty, washing with plenty of soap and water and afterwards with a disinfectant, and finally by the use of an antiseptic compress for some hours.

The instruments, when you have seen that they are clean after their use in previous operations, are put into boiling soda and water. The soda not only prevents rust, but helps to destroy the bacteria. Five minutes boiling will sterilise them.

The swabs and dressing pads are sterilised by being exposed to a high degree of dry heat.

The hands of the surgeon and his assistants are washed and scrubbed with soap and water and a *clean* nailbrush, and are then soaked in disinfectant for several minutes; and are not dried. If the nurse has to touch anything that goes near the wound, such as sterilised towels, used for packing round it, she must cleanse her hands as carefully as the surgeon does.

A large towel, with a slit 10 or 12 inches long in the middle and two or three small towels, should be boiled for an operation on the trunk.

If a limb is to be operated on, it should be carefully bandaged from the hand or foot up to the site of the operation with a bandage wrung out of antiseptic lotion.

CHAPTER XIX

HÆMORRHAGE

IT is of importance to a nurse that she should have a clear idea of the various ways in which nature stops bleeding.

An artery possesses considerable elasticity in its structure, and when it is divided the cut ends separate one from the other. But the sheath containing the artery is not elastic, and when it is divided either by accident or disease, the artery retracts *within its sheath*, and its orifice becomes smaller. The contraction of the orifice is due partly to elastic fibres, and partly to a layer of muscular tissue arranged circularly in the wall of the vessel, and constituting its so-called middle coat. At the same time blood is poured out inside the sheath and into the tissues around, which forms a clot.

Thus the escape of blood is rendered less easy by the contraction of the orifice and the pressure of the clot; it may even be stopped altogether, in which case clotting takes place in the vessel itself.

So there are three stages in the

Primary Arrest of Hæmorrhage

1. The retraction of the divided artery within its sheath and the contraction of its orifice.

2. The formation of a clot or coagulum of blood in the sheath of the artery and in the tissues around the sheath.

3. Formation of coagulum within the vessel.

If the bleeding has been severe another factor is brought into action. The loss of blood causes faintness, and the heart beats more feebly, and does not send the blood into the arteries with the same force as usual, so that it escapes less freely from the wounded vessel. The lessened pressure in the artery enables the blood to clot more readily, and the artery becomes firmly

plugged up by clot. Thus the faintness, which results from the loss of blood, is in itself an important agent in stopping bleeding, and is of great service, especially when the source of bleeding cannot be reached, as in an internal organ.

This is the reason why stimulants should not be heedlessly given in fainting caused by hæmorrhage, for by giving stimulants we increase the heart's action, and may drive out the clot with which nature is closing up the bleeding vessel. Excitement also quickens the heart's action, and it is important to keep the patient as calm and quiet as possible—tell him that the bleeding is sure to stop soon.

In cases of severe hæmorrhage the surface of the body is cold and covered with sweat, the pulse is feeble and the respiration shallow. The patient should be wrapped in hot blankets, with hot bottles applied to the feet, and should not be given brandy or other stimulants. His head must be kept low, whatever is the seat of the bleeding. He becomes very restless if there has been great loss of blood, and the doctor will probably give opium or morphine.

Thus the treatment of internal hæmorrhage is—

1. Rest in bed.
2. Quieting excitement and restlessness.
3. Warmth, hot blankets and hot bottles.
4. Opium (administered by *the doctor*).
5. Avoidance of stimulants.

Ice to the chest or abdomen is sometimes ordered, but it is of doubtful use, and it is certainly of importance that the patient shall be kept warm.

The treatment of external hæmorrhage is somewhat different. When the injured vessel can be got at, the most important treatment available is *Pressure*, either at the bleeding spot, or on the main artery going to the spot.

Suppose a case of a ruptured varicose vein in a leg—an accident by which many lives have been lost. The patient must lie down, and raise the leg. This, by itself, will often stop the bleeding. Undo any tight strap or garter round the leg, and place your finger on the bleeding spot, until a small pad can be

prepared, which can be held firmly in place by a handkerchief or bandage. Quite a small amount of pressure is enough to stop venous bleeding.

The same treatment holds good in arterial bleeding. Make the patient lie down, and raise the limb. When a man is lying down his heart beats less strongly, and the blood will not pass with so much force out of the cut artery. Bleeding from a scalp wound can always be controlled quite easily by a pad and bandage, or the pad can be kept in position by the hand until help arrives.

Slight pressure suffices to stop the bleeding from small wounds in the limbs; but when the vessel wounded is a large one, pressure should be applied to the main artery above the seat of injury, by means of the finger pressing the artery against the neighbouring bone. Digital compression is of great value because it can be applied at once, but it cannot be continued for many minutes together by one person. And it cannot be applied usefully without an exact knowledge of the best position for compressing the artery against the bone.

There are several points to remember in compression—

1. As far as possible the artery only should be compressed.

2. The limb should not be tightly encased by the hands, as there is no object in interfering with the venous circulation.

3. The thumb should, as a rule, be used for exerting pressure.

If digital compression cannot be kept up for a sufficiently long time, a tourniquet may be improvised, being prepared by another person while the digital pressure is still kept up.

Take a handkerchief and roll it up with a cork or a pebble in the folds to act as a pad. Place the pad on the artery, and knot the handkerchief loosely round the limb. Then a stick is to be passed between the limb and the knot, and twisted round, till there is enough pressure to stop the bleeding; too much pressure is injurious; and be careful that the pad is in the right place.

There are cases where direct *plugging* of the wound is the only available course, such as a wound at the base of the neck, or an aneurism which has burst. Pieces of clean old linen are the best

for the purpose, when gauze is not to be obtained. It must be packed tightly into the wound, beginning with the deepest parts.

Bleeding from the rectum after operation for piles is controlled by plugging. A good plug for the purpose is made by a sponge tied round with tape. When the sponge is introduced the tape is pulled to keep the sponge from slipping upwards.

During an operation on a limb an Esmarch's indiarubber tourniquet is applied. The limb is raised, and firmly stroked towards the trunk with the object of rendering it bloodless, and is then contracted by an indiarubber band tightly pulled round the limb. This prevents any loss of blood during the operation.

Heat and cold check capillary hæmorrhage. Iced water is syringed up the nose, or is held in the mouth for oozing in those parts, and extremely hot water, or lint wrung out in water hotter than the hand can bear, is used for general oozing from a wound.

Occasionally, when all other means fail, a **cautery** is applied to the bleeding spot. A platinum point, made red hot by an electric current, or some other method, just touches the point of bleeding, when it can be seen, as in the mouth or nose. The cautery is also used instead of a knife in operating on growths and structures that bleed very easily, such as nævi and piles.

Styptics are substances which check bleeding when applied to the surface. But they are used as little as possible on wounds, because they irritate the cut surfaces so much that primary union is prevented.

The least harmful styptic is hazeline; it is used as an injection into the bladder, or as an ointment for piles.

Alum and tannin are sometimes applied as powders to the bleeding surface. Perchloride of iron is the most powerful styptic, but it is regarded as a last possible resource.

During an operation **torsion forceps** (Spencer-Wells) and **ligatures** of silk, etc., are used for bleeding vessels. The artery is seized by a pair of forceps, and either twisted or tied.

Sometimes after the extraction of a tooth there is a steady oozing of blood from the socket. If a styptic is applied, the mouth probably becomes foul and ulcerated. The treatment that is most useful is very simple. Take a strip of gauze or

thin old linen, and pack it into the socket with a probe—a blunt knitting needle will do—after having cleared out the accumulated clot. Then take a piece of a small cork, and cut it so that it fits on the top of the socket, and projects a little above the level of the other teeth. Bandage round the head and below the jaw so that it is firmly fixed, and the continued pressure will stop the bleeding.

Bleeding from the nose is treated like all other hæmorrhages by making the patient, in the first place, lie down flat. If this alone does not stop it, raise the patient's arms above his head, and keep them there. Notice which side the blood comes from, and press that side of the nose against the septum (the central division of the nose), as the bleeding point often occurs on the septum. If all fails, apply ice externally, or syringe with iced water, but this should not be done in a hurry, as it would wash away any clot that had formed on the bleeding point. The last resort is plugging. This is generally done from the back of the mouth, and is outside a nurse's province.

CHAPTER XX

DISEASES OF THE NOSE AND THROAT

NURSES are often concerned with diseases affecting the cavities of the nose and throat, and it is important that they should understand something of their structure and uses.

Each nostril leads into the *nasal cavity*, which is separated from the opposite side by a thin division or *septum* formed of bone and cartilage. The roof of the mouth forms the floor of the nasal cavity, and at the back of the bony palate the partition is continued by the fleshy soft palate.

There are two openings at the back of the nasal cavities, which are called the posterior nares, and through these the air passes from the nostrils to the lungs.

Each nasal cavity rises in a high vault above the posterior nares, and is separated from the brain cavity by a very delicate plate of bone, containing small holes, through which branches of the olfactory nerves pass out to the upper part of the nose, to provide the sense of smell.

This bone is sometimes fractured in injuries to the skull, and the escape of blood from the nose is one of the symptoms of "fractured base."

The upper part of the nasal cavity, through which the air moves slightly in ordinary respiration, is the part concerned in the sense of smell. When we want to smell more acutely we "sniff" the air up into the upper part of the nose, where the olfactory nerves are situated.

It is obvious, also, that to pass a nasal tube the point must be directed along the floor of the nose, for, if it was pointed upwards to the turbinal (spongy) bones, it would meet with obstruction and would give rise to pain, if not injury.

When we have a "cold in the head," the mucous membrane of the lower turbinal bones becomes swollen, and prevents the

odorous particles from reaching the upper part of the cavity—we lose our sense of smell.

A clear passage through the nose gives character and resonance to the voice; when the nose is blocked up the voice sounds flat. But it is also of great importance in warming and moistening the air on its way to the lungs, and continual blocking of the nose, with consequent breathing through the mouth, is of injury to the general health.

On the outside of the nasal cavity is the upper jaw, which contains a cavity called the maxillary antrum, which is often found to contain pus. The suppuration is set up by decayed teeth, the fangs being very close to the antrum. The first symptom of abscess in the maxillary antrum is often a discharge from the nostril. The surgical treatment is frequently to remove the decayed tooth, and to drain the cavity through the tooth socket.

Another cavity leading into the nasal cavity is the frontal sinus, just above the root of the nose.

The nasal cavities open below into the pharynx, the upper part of which is called the *naso-pharynx*.

Into the pharynx, on each side, is the funnel-shaped opening of the Eustachian canal, a tube which communicates with the middle ear. It is quite easy for infective material to spread along this tube from the pharynx to the ear, where it may set up suppuration and discharge. This happens very often in scarlet fever; which is often followed by **otitis media**, or inflammation of the middle ear.

In syringing the nose, the nurse should use little force. The opening of the Eustachian tubes is so close to the nasal cavities, that great force would drive material from the nose up into the middle ear, and thus bring about the very mischief it is sought to avoid.

A very common disease of the naso-pharynx is **adenoids**. These are soft growths, readily bleeding, which spring from the roof and back of the nasal cavity. They stop the passage of air through the nose to some extent, perhaps altogether, so that all respiration takes place through the mouth, and the patient acquires a typical expression, rather vacant and stupid, chiefly due to the half-open

mouth. The voice resembles that of a person with a bad cold, in which the letters m and n are changed for b and d—*e.g.* "means" becomes "beads."

Adenoids also cause deafness, owing to the blocking of the Eustachian tubes. It is necessary for hearing that these canals should be clear, and when they are blocked, either permanently by adenoids, or temporarily by swollen mucous membrane, as in a cold, the result is deafness.

The pharynx becomes much narrower as it approaches the œsophagus.

There is yet one more opening into the pharynx, making the sixth—viz. the epiglottis, which leads into the trachea.

Post-pharangeal abscess is a disease of the back of the pharynx, caused by a collection of pus behind the wall of the pharynx, which pushes the latter forward, and, by filling up the space, seriously interferes with breathing and swallowing. There is also the danger of the abscess bursting through the wall and discharging into the larynx and causing suffocation.

This form of abscess often arises from caries of the upper cervical vertebræ. It sometimes follows scarlet fever.

At the back of the mouth are the **fauces**, two pillars of mucous membrane and muscle, and a projection on the inner side of each, the **tonsils**. The tonsils are especially liable to become diseased in young people; they are inflamed and enlarged so much that they meet in the middle line and cause much distress. The instrument used for removing the tonsils is called a guillotine. This is chronic tonsillitis, and often accompanies adenoids.

Acute tonsillitis occurs in quinsy and in diphtheria. **Quinsy** is a very large swelling of the tonsil, containing pus, which makes swallowing very difficult or impossible.

The earliest appearance of membrane in diphtheria is generally on the tonsils, from which it may spread down the larynx or up the nose.

CHAPTER XXI

SURGICAL ASEPSIS

SEPSIS signifies putrefaction. A putrefying wound—that is, one containing or discharging pus, is treated with *anti*septics, or substances that will destroy the pus-producing or pyogenic organisms which are already present in the wound. But the aim of the operator who makes a surgical wound is to prevent any of these organisms from finding entrance to the wound; in other words, to maintain *a*sepsis, the absence of putrefaction.

In a large hospital, where the house-surgeon and dressers are the only assistants at an operation, a nurse is not allowed to touch anything that is to be used near the wound; but she ought to be able to understand and follow the sterilising process that she may be able to supply the necessary materials. In addition, she will, in private work, often have to prepare everything wanted for the operation.

She must understand first, that in a hospital everything is swarming with germs or organisms, both harmless and putrefactive. The patient's skin, the doctor's hands, the instruments, ligatures, dressings, bandages, are all septic, and must be disinfected and made sterile before the operation is begun. That is, they must be made free from germs, which would enter the wound, multiply there, and produce suppuration. That they are full of organisms can be proved by the use of the microscope, and also by making "cultures" from any of them.

In a private case, the preparation of the patient's skin is often entrusted to a nurse. It has to be done with the same scrupulous care that the surgeon himself would use. She must first wash her own hands, and then, with plenty of soap and water, thoroughly cleanse the skin for a wide distance round the probable position of the incision. The skin is then shaved, whether there is little or much hair on it, and is next scrubbed

with a clean nail-brush and soap and water, as hot as it can be borne, to which some liquor potassæ has been added. The nail-brush is previously cleansed by being boiled for a few minutes and soaked in a disinfectant till it is wanted. The skin must now be washed with lint dipped in lysol and liquor potassæ, and, finally, with whatever antiseptic solution the surgeon prefers, whether carbolic acid, formalin, or perchloride of mercury. Then the whole of the cleansed area is covered with a double piece of lint, soaked in and wrung out of one of these solutions, over the lint a piece of gutta-percha tissue is laid, and it is all firmly fixed on with a bandage. An abdominal compress should always be put on with a turn or two of bandage round each thigh, to prevent its rucking up and uncovering the cleansed skin.

The readiest way of sterilising instruments and ligatures is to boil them. They are put in a vessel large enough for them to be entirely covered with water, not into a small pan with their handles sticking out, and they are boiled for ten minutes. Common washing soda is often added to the water, both because it has a destructive effect upon the organisms, and because it prevents the instruments from rusting. About a tablespoonful of soda is used to a pint of water, which should be boiling before the instruments are put into it. If the vessel has a loose iron tray, the instruments are lifted out in it, and if there is no tray, they are taken out by a sterilised pair of forceps. They are immediately put into a tray containing sufficient carbolic acid solution or lysol to cover them entirely. The tray itself should have been boiled beforehand, or well rinsed out with carbolic. The instruments are quite covered with disinfectant, because it has been found that the very air of a hospital contains pyogenic germs, which are set free every time a suppurating wound is dressed, and which may be deposited on an uncovered instrument and so find access to the wound.

The horsehair and catgut used for sutures can be boiled at the same time as the instruments. Silk sutures need more attention. The silk should not be wound on a wooden reel many layers deep, but on a glass rod, and not more than two layers thick. It is then boiled for half-an-hour, and placed until

it is wanted in a glass jar containing carbolic, with a tightly-fitting cover. Only a surgically clean hand or instrument is allowed to touch the suture after boiling.

The towels and overalls are boiled for half-an-hour in plain water, or soda and water, and are put into a clean bucket of lysol until the operation. The lysol must *cover* the towels, and the bucket, which should be of white china or white enamelled iron, should have a well-fitting cover. If it is impossible to boil the towels, they may be left soaking in lysol for quite twenty-four hours before they are wanted for use. The dresser takes them out of the bucket (which the nurse must uncover for him) and wrings them out with sterilised hands. They are then placed around the wound. The nurse should arrange mackintoshes over the blankets, patient's clothing, etc., to avoid their being wetted by the towels. For a large operation she should prepare a towel about five feet square, with a hole slit in the middle about eighteen inches long, and three or four small towels the size of an ordinary hand towel.

At the operation, if the nurse has to assist in threading needles, handing instruments, etc., she must prepare herself as a dresser does. The nails must be cut as short as possible and carefully brushed, the sleeves turned back to the elbows, and the hands and fore-arms well scrubbed with hot water, soft soap, and liquor potassæ. The hands are then, without being dried on a towel, plunged into a basin of lysol, and are again carefully scrubbed and washed, after which they must touch nothing but aseptic objects. They must not, for instance, take hold of a jar of sutures or a syringe of brandy, without being immediately disinfected again. Nothing can be regarded as aseptic in an operation except the hands of the surgeon and the dressers, the skin of the patient, the instruments, sutures, ligatures, sponges, towels, and overalls. Everything else is surgically unclean, and touching anything unclean necessitates careful re-sterilising of hands, instruments, or whatever has come in contact with the non-sterilised object. It cannot be too carefully remembered that blankets, basins, tables, mackintoshes, and even the edge of the basin containing the antiseptic solution, may abound in

germs, and in such a place as a large hospital not only may, but do, abound.

When the towels and overalls are wrung out ready for use, they are placed in a basin which has recently been well washed out with carbolic. The compress is removed by the dresser, who washes the skin again with lysol and liquor potassæ, and finally wipes it over with formalin or perchloride of mercury solution. The nurse opens the bag of sterilised pads without touching the contents, and holds it for the dresser to take out the sponges he requires, which he lays on a sterilised towel, covered by another towel.

In an operation of any length, the hands should constantly be re-dipped in an antiseptic solution. Instruments should be replaced in the antiseptic as soon as they are done with, and not allowed to lie on the towels, for you can never be certain that the towels are absolutely sterile. When the wound is sewn up, all blood and other matter must be carefully removed from the surrounding surface, before the sterilised dressings are applied.

Sometimes the wound cannot be altogether closed, but drainage has to be maintained for a longer or shorter time. This is the case whenever the wound is septic from the beginning, as in compound fractures, and in most abscesses, and also when tumours or tissues have been removed in such quantities that there is a cavity left in which blood and serous discharge might collect. Drainage is also indicated after long operations where the tissues have been much damaged by continued or severe manipulation.

Strips of sterilised gauze, or of sterilised iodoform gauze generally form the drainage material. But, in certain special cases, where permanent drainage is required, as in pelvic abscess, suppurative peritonitis, etc., rubber or glass tubing may be necessary.

If the operation has been conducted on such lines as to ensure the sterile condition of the wound, it is clear that nothing but sterilised pads and sterilised gauze must be applied to its surface. In all cases where there is the possibility of much discharge, the wound is covered with three or four layers of sterilised pads,

and outside these a layer or two of antiseptic material, such as salicylic wool, before the bandage is put on. The bandage must quite cover in all the dressings; it must be firm, and secured here and there with safety pins or stitches, so as to avoid all chance of the dressings slipping, and the bandage or wool coming into contact with the wound.

The same antiseptic precautions are to be observed at the subsequent dressings of the wound. The hands of the dresser must be surgically clean, being washed before touching the patient, and being again thoroughly washed and disinfected after the bandage and upper layers of the dressing are removed; the instruments used must be boiled, the wound covered with lint dipped in lysol or carbolic; while the surrounding surface is cleansed and freshly sterilised pads put on again, no matter how clean those look that have just been removed. And the wound should be left exposed as little as possible. The nurse should hold the hands of a child, or an excitable or delirious patient, while the dressing is being done, for fear of his touching and infecting the wound.

PART III

MEDICAL LECTURES

CHAPTER XXII

THE ALIMENTARY SYSTEM

THE body is made up of various structures—muscles, tendons, bones, blood-vessels, nerves, etc., and these are made up ultimately of various chemical elements. When a chemical element is spoken of, we mean a substance which cannot be decomposed or separated into any simpler form of matter than itself. Altogether, there are sixty-four of such elements, but, of these, only about sixteen are found in any quantity in the human body. Some of the more important elements in the body are, oxygen, hydrogen, carbon, nitrogen, chlorine, sulphur, phosphorus, potassium, sodium, calcium, and iron.

Oxygen (O) is one of the most abundant elements; it forms eight-ninths of all water, and about two-thirds of the human body. When free it is a colourless gas. (Therefore it is invisible, as in the cylinders of compressed oxygen that we use in the wards.)

Hydrogen (H) is never found free. It is also a colourless gas. Combined with oxygen it forms water. The chemical symbol for water is H_2O; meaning that two particles of hydrogen are chemically united with one part of oxygen.

Nitrogen (N) is the most important and characteristic element of animal substances. It is also a colourless gas. It will not support life nor combustion. It is largely contained in animal foods, meat, etc. Combined with hydrogen it forms ammonia (NH_3).

Carbon (C) is the most important and characteristic element of vegetable substances. Charcoal and diamond are examples of carbon, the latter being pure carbon. In conjunction with twice

its amount of oxygen, it forms carbonic acid gas (CO_2). This gas is excreted from the body in the air driven out of the lungs during breathing.

Sodium (Na) is a mineral element. Combined with chlorine it forms common salt, chloride of sodium (NaCE). Potassium (K), calcium (Ca), phosphorus (P), sulphur (S), iron (Fe), etc., are also found in the body combined with other elements.

In every living body there is a constant waste of the tissues taking place; even during sleep there are mechanical, muscular, nervous, and chemical movements which never cease during life; the blood is always circulating, the heart is beating, the chest is moving, the lungs are taking in and expelling air, the oxygen of the air is always combining with and destroying the tissues of the body. The body has to be supplied with food to counteract this waste, and the chemical force which is evolved from the digestion and absorption of the food is used up to maintain the heat of the body, its muscular movements, and its nervous force, just in the same way that a steam engine must be constantly supplied with fuel to generate the force necessary to keep it going.

A knowledge of the amount and composition of these waste products is necessary before an estimation of the proper quantity and quality of the food can be made. The waste products of the body are got rid of through the lungs, skin, kidneys, and bowels.

1. Through the lungs, carbon, hydrogen, and oxygen are excreted, in the form of water, carbonic acid, and ammonia; we can see for ourselves that water is contained in the air we expel from our lungs, by noticing the moisture that forms on a cold glass when we breathe on it.

2. Through the skin we get rid of carbon, hydrogen, and oxygen, especially the last two in the form of water—*i.e.* perspiration, which is always exuding from the skin, though it is often "insensible."

3. Nitrogen, hydrogen, and oxygen are excreted in the urine from the kidneys in the form of water, urea, etc.

4. Nitrogen, hydrogen, and carbon are got rid of by the bowels in the form of fæces. Small amounts of sodium, potassium,

phosphorus, sulphur, etc., are also excreted in the urine and fæees.

It follows, therefore, that as these chemical elements are always being exereted from the body, the food which is taken into the body must consist of the same chemical elements, in order to replace those which are excreted, and to keep the tissues healthy.

There are five classes of food, all of which are necessary for the health of the body.

1. **Nitrogenous foods**, or proteids, are made up of albumen, casein, etc. These are composed of the elements carbon, hydrogen, oxygen, nitrogen, and a small quantity of phosphorus and sulphur. The most important nitrogenous food is animal flesh, which contains nitrogenous bodies, fatty matters, salts, water, about 72 per cent., and earbo-hydrates. Beef contains the most nitrogen, about 20 per cent. Pork is less digestible than beef, and contains half the quantity of nitrogenous substances. Other nitrogenous foods are eggs, milk, peas, and beans.

2. The **non-nitrogenous foods** are the carbo-hydrates, which contain earbon, hydrogen, and oxygen. The chief carbo-hydrate foods are bread, which contains 50 parts of starch per cent.; vegetables, espeeially potatoes, whieh contain starch and sugar; fruits, which contain sugar and various aeids.

3. **Fats**, which eontain earbon, hydrogen, and nitrogen; such as eream, butter, lard.

4. **Salts.**—All the preeeding elasses of food, eontain more or less salts, aecording to the quantity required in the food; but certain salts in green vegetables and fruits are necessary, in addition, for maintaining the health of the body.

5. **Water.**—This is taken in tea, eoffee, beer (which eontains a eertain amount of alcohol, from 1·2 to 8·8 per eent.), cider, wine, and spirits.

Milk eontains all the elements of a typical diet, henee a patient suffering from typhoid fever can live on it alone for months together; and babies, who ought to be fed exclusively on milk during the first nine months of their lives, thrive and grow without any other food. The composition of milk is as follows:—

Casein	4·1
Fats (in the cream) . . .	3·9
Sugar (lactose) . . .	5·2
Salts	·8
Water	86

Preparation of certain foods.—Cooking makes food more digestible, and should make it more agreeable to the palate and eyes. The cell-walls of vegetables are made of an indigestible substance, called cellulose, and the effect of cooking is to break down these cell-walls, which contain the nutritive parts of the food, in order that the digestive apparatus may be able to act on them. In raw meat the indigestible sheath of the muscle-fibres is broken down, and converted into jelly, so that it can be acted on by the digestive fluids.

The diet necessary to keep a man in health must consist of all the above kinds of food.

The full diet at Guy's is—

Bread	12 oz.
Butter	1 oz.
Potatoes	8 oz.
Meat	6 oz.
Milk . . .	one pint.
Water . . .	as required.

The food supplied in the Royal Navy is another example of a typical diet, as it is regulated by a knowledge of the chemical waste that takes place in the body, and of the amount and kind of material necessary to supply the place of the excreted elements.

Digestion is the process by which the different foods are prepared for their absorption by the blood-vessels and lymphatics of the alimentary canal.

The alimentary canal is the musculo-membranous canal through which the food passes. It commences with the mouth, which is the cavity which receives the food. In front are the lips, at the sides the cheeks, the roof is formed by the hard palate, and at the back is the soft palate, which separates it from the nose. Behind the soft palate and the uvula, which is a prolongation of

the soft palate, there are on each side the fauees and the tonsils. In the floor of the mouth is the tongue, and under the tongue is a little thin band of mucous membrane called the frenum. The inside of the mouth and the tongue, as well as all the other eavities of the body, are lined with mueous membrane. The teeth are thirty-two in number, sixteen above and sixteen below. In each jaw there are four incisor, two eanine, four bicuspid, and six molar teeth.

There are three pairs of salivary glands which open by means of ducts into the mouth. The parotid gland is situated below and in front of the ear. It is a large gland, and it is this which becomes swollen in mumps or parotitis. The sub-maxillary glands are in the lower jaw, under the mouth, and the sub-lingual under the tongue. All these glands secrete the saliva, which is a thin watery viscid fluid eontaining some mucus, and an important nitrogenous body called ptyalin, which has the property of eonverting starch into sugar. The saliva also keeps the mouth moist, it dissolves eertain substanees, sueh as sugar and salt, and it mixes with the food so as to form it into a soft pulpy mass. It is therefore necessary to perfect digestion that the food shall be thoroughly mixed with the saliva in the mouth, and not bolted whole without mastieation.

Next to these struetures is the pharynx, which is behind the nose, and mouth, and larynx. It always remains open to allow air to pass from the mouth to the larynx. At the root of the tongue is the epiglottis, a little flap of cartilage whieh covers over the opening of the windpipe during the swallowing of food.

Below, and continuous with the pharynx, is the œsophagus, a long museular tube lined with mucous membrane. It is the narrowest part of the alimentary eanal, and is about nine inches in length. During deglutition its muscular fibres eontraet and force the food onwards. It passes through the diaphragm to the cardiac end of the stomach. (The diaphragm is the large muscle which divides the chest from the abdomen).

The stomaeh is a large pouch, which can hold about two quarts. The eardiae end of the stomach is continuous with the œsophagus; the lower end, called the pylorus, is a narrower

opening. The walls of the stomach are made up of four coats. The outer is the peritoneum, which is the same membrane which covers all the abdominal organs; then come the muscular, sub-mucous, and mucous coats. The mucous coat contains a number of little tubes and glands which secrete a fluid called gastric juice. This gastric juice contains pepsin, which has the property of digesting proteids.

Continuous with the pylorus is the duodenum, the first part of the small intestine, ten inches in length. Into it opens the bile-duct, which carries the bile from the gall-bladder and liver. The liver is the largest gland in the body; it is situated on the right side of the abdomen. The bile emulsifies fat—that is, it breaks it up into extremely fine particles, and mixes it with the other contents of the duodenum. On the inner side of the duodenum is another gland, the pancreas, which also pours its secretion into the duodenum. It contains a nitrogenous substance, pancreatin, which acts on starchy substances. Continuous with the duodenum is the jejunum, eight feet in length. It is usually found empty, and is very rarely diseased. Below this is the ileum, about twelve feet in length; then the first part of the large intestine, called the cæcum, which is a long blind pouch about three inches long, situated in the iliac region. From its lower extremity proceeds a small narrow tube about the size of a goose quill, and from two to three inches long, with a blind extremity. This is called the vermiform appendix. Above the cæcum comes the colon; as it passes upwards it is known as the ascending colon; then it passes across the abdomen, and is called the transverse colon; and then turns downwards to the left iliac fossa, where it is called the descending colon. In its lowest part it makes an S-like curve, the sigmoid, and ends in the rectum, the extremity of which is guarded by a sphincter muscle.

The walls of the intestine also contain muscular fibres, which, by their worm-like movement, force the food downwards. The intestines, like the stomach, are covered by the fine delicate membrane called the peritoneum, which also covers the liver and spleen, and lines the abdominal wall, and binds the intestine to the vertebral column.

Deglutition, digestion.—After the solid food has entered the mouth, it is broken up (masticated) by the teeth, and mixed intimately with the saliva, rolled over and over again by the tongue, while the starches are converted into sugar; and substances like salt, sugar, etc., are dissolved, and give rise to the sensation of taste by stimulating the taste nerves. Then the epiglottis closes off the cavity of the glottis, and the soft palate closes that of the nose, while the tongue throws the mass back into the pharynx, where it is grasped by the contraction of the muscles, and forced downward into the stomach. Then the stomach begins to contract and roll the food about, the gastric juice is poured out and mixed intimately with it, thereby converting the proteids contained in the food into liquid peptones. When the food has reached this stage of digestion it becomes more liquid, looking like pea-soup, and is called chyme. It passes through the pylorus into the duodenum, where it mixes with the bile and pancreatic fluid; the bile emulsifies the fat so that it can pass into the lymphatic vessels, and the pancreatic juice acts on the starches which have escaped the action of the saliva, and on the proteids which have not been converted into peptones by the gastric juice. It is now called chyle. The chyle is forced on through the jejunum and ileum by the muscular action, and during its passage the fatty parts are absorbed by the lymphatics and the peptones and sugar by the veins.

The indigestible matters are pushed farther on till they reach the cæcum. They become more acid, and finally reach the rectum, where they collect until they are expelled as fæces.

Absorption.—The mucous membrane which lines the small intestines, is supplied abundantly with small thread-like processes called villi. Each villus consists of a small central lacteal vessel surrounded by a capillary network, the whole being covered with a basement membrane and epithelium. The lacteals unite and form larger vessels which form the thoracic duct, which ascends in front of the spinal column, and opens into the left subclavian vein, pouring its nutritious milky fluid directly into the vein.

CHAPTER XXIII

SOME OF THE DISEASES OF THE ALIMENTARY CANAL

ONE of the most frequent symptoms of disease of the alimentary canal is vomiting—that is, the forcible ejection of the contents of the stomach through the pharynx and mouth.

The vomiting may be due to—

1. Irritation of the tonsils or pharynx.
2. Local disorders of the stomach—
   - Dyspepsia.
   - Gastritis.
   - Gastric ulcer.
   - Cancer of the stomach, etc.
3. To diseases of other parts of the alimentary canal—
   - Duodenal ulcer.
   - Intestinal obstruction.
   - Lead colic.
   - Appendicitis.
   - Peritonitis, etc.
4. To diseases of the nervous system—
   - Meningitis.
   - Cerebral tumour.
   - Locomotor ataxy.
5. To affections of other organs—
   - Pregnancy.
   - Renal and biliary colic.
   - Uræmia, etc.
6. To the onset of acute illness—
   - The fevers, etc.

There are several points to be noticed with regard to vomiting in order that the nurse may be able to answer the questions that are likely to be asked by the physician.

1. The relation of the vomiting to the ingestion of food.

If the vomiting takes place immediately after food, and if there is pain with it, it is probably due to some local irritation of the stomach, such as acute gastritis or gastric ulcer.

If the vomiting occurs two or three hours after taking food, and is preceded by a sense of distension, heartburn, acidity, and flatulence, it indicates that the digestive processes have not been properly at work; this occurs in cases of gastritis, dyspepsia, ulcer, and cancer of the stomach.

Early morning sickness is characteristic of alcoholism.

If the vomiting is a large quantity every two or three days, it proceeds from a dilated stomach.

When there is reason to suspect hysteria, notice if the vomiting is excited by the patient (by the finger being pushed down the throat, etc.).

The quantity and the character of the vomit must be observed. It may be like the food ingested, especially if it soon follows on food being taken, as in stricture of the œsophagus.

If it comes on several hours afterwards, as a clear, sour fluid, it is probably due to disturbance of the digestion.

If it is mixed with bile it will be of a green or yellow colour.

In some cases—*e.g.* in dilated stomach, the vomit is frothy and like coffee-grounds. The frothiness is due to fermentation of the contents of the stomach, and the coffee-ground appearance to altered blood—that is, blood which has been acted on by the digestive fluids.

The vomit may be fæcal in odour, and attended with absolute constipation, as in intestinal obstruction. But fæcal vomit, without absolute constipation, occurs in gastro-colic fistula—that is, an opening from the stomach directly into the colon.

Blood in the vomit is called **Hæmatemesis**, and must be distinguished from Hæmoptysis, in which condition the blood comes from the lungs, it is coughed up, not vomited, and is frothy and bright red in colour. If the hæmatemesis is a large amount of blood, it may be bright red, but not frothy. It is oftener of a dark red or blackish colour. It may come up in clots, or it may be so much changed by the action of the gastric juice that it looks like coffee-grounds.

Hæmatemesis occurs in ulcer of the stomach, cancer of the stomach, and cirrhosis of the liver.

But it may be due to swallowed blood, as in epistaxis, where the blood trickles from the back of the nose down the throat, and is sometimes vomited afterwards. A malingerer may produce it by sucking his gums till they bleed.

Treatment.—The patient must be kept strictly in bed, and must lie flat on his back, without a pillow. He must have no food by mouth, but a little ice to suck or iced water in teaspoonfuls may be given him to moisten the mouth. He must be fed by nutrient enemata or suppositories only, and he will probably be treated by astringent drugs, such as tannin, acetate of lead, tincture of perchloride of iron, or hypodermic injection of ergotin.

Fæces.—The points to notice about the fæces are the amount, frequency, consistence, colour, and constituents. They may be—

Consistence.—Of a natural consistence.

Hard lumps, called scybala, in constipation.
Semi-solid (unformed).
Loose in diarrhœa.
Like pea soup in typhoid fever.
Watery, with flakes of mucus floating in them, as the "rice-water stools" of cholera.

Colour.—They vary much in colour. They may be—

Whitish or clay-coloured in jaundice.
Yellow in typhoid fever.
Green in infantile diarrhœa.
Black, called melæna, from blood which has been acted on by the gastric juice. They may also be black from the action of certain drugs, iron and bismuth.
Bright red, owing to blood from piles, from typhoid and other ulcerations, dysentery; and, in children chiefly, from intussusception and rectal polypi.

Constituents.—Besides the natural constituents, they may contain undigested food (as curds of milk), grape skins, currants, etc., fruit stones, and gall stones.

They may contain bodies accidentally swallowed, as coins.

There may be mucous casts—*i.e.* pieces, large or small, of the membrane lining the intestine.

They may contain parasites, thread-worms, round-worms, and tape-worms.

Diarrhœa is the passage of motions more often and of looser consistence than is normal. It is caused in various ways. It may be in consequence of excessive peristaltic action of the muscular coats of the bowel. By peristalsis is meant that worm-like movement of the muscular wall of the intestine which grasps its contents and pushes them onwards. The diarrhœa may proceed from increase of the intestinal secretions, or from morbid (unhealthy) conditions of the mucous membrane.

Diarrhœa is caused by chill, by irritating foods (unripe fruit, etc.), by drinking impure water, by medicines, by the ulceration of typhoid, tubercle, or dysentery, by general illnesses, such as septicæmia, and by acute fevers.

The treatment of diarrhœa entirely depends on the cause of it.

If it is due to irritating foods, a purge must first be given to clear out all these irritating substances.

If it is due to disease of the mucous membrane or intestine, a purge is not given, but in both these cases the patient must be kept warm in bed, and must only take simple fluid food in small quantities at a time, gruel, arrowroot, beef-tea, milk, and soda-water, and these must be cold or lukewarm. The drugs given are astringents like hæmatoxylin (logwood), catechu, aromatic chalk powder, tincture of opium, etc.

The diarrhœa of typhoid is left alone unless it is excessive; three or four motions in twenty-four hours would not need treatment, but if it becomes more frequent, an enema of starch and opium is given.

Constipation is retention of the fæces. The healthy action of the bowels depends on—

1. A sufficient supply of food.
2. The natural secretion of the intestinal juices.
3. The natural action of the intestinal muscles.

It may be due to many causes; sedentary habits (want of

exercise), promote constipation, and a too dry diet, or too much animal food also encourages it. It often occurs in the acute febrile diseases (measles, erysipelas, etc.). It is sometimes the result of mechanical causes, such as a retroflexed uterus, or tumours of the uterus or ovaries, which obstruct the intestine by their pressure. New growths in the wall of the intestine also cause constipation.

The diet must be carefully regulated in cases of habitual constipation. The use of fresh fruit and vegetables and brown bread promotes the action of the bowels. A due amount of exercise in the open air is necessary, and sometimes a tumblerful of cold water before breakfast acts as a laxative.

If the constipation is due to weakness of the muscular action, nux vomica with iron and aloes is often given as a pill. Other commonly-used purgatives are the saline waters, such as Carlsbad water, cascara sagrada, sulphate of magnesium, etc., which increase the secretions.

Stricture of the Œsophagus.—The œsophagus is one of the parts of the alimentary canal in which cancerous growths are often found. The growth narrows the calibre of the tube, and constricts it, and the food cannot readily pass the obstruction. The patient first notices a difficulty in swallowing ordinary food, and soon has to give it up altogether and a soft or liquid diet is substituted. After a time even liquids cannot be swallowed. Associated with this difficulty in swallowing is pain in the back and marked and rapid wasting. The patient becomes weaker and weaker, and, unless relieved, he soon dies of starvation and exhaustion.

Rectal feeding is often resorted to in this condition.

The surgical treatment is the passage of one of Mr Symonds' tubes through the stricture. This is a hollow conical tube, which is left in place after being passed, and is secured by a string left out at the mouth, and fastened round the ear. Milk and other very thin liquid food can then be easily taken. If for any reason this tube is not available, an opening is made into the stomach through the abdomen, and the patient is fed through a tube passed directly into the stomach.

Gastritis is an inflammation of the stomach, which may be caused by poisons, decomposed food, shell fish, etc.

Dyspepsia or indigestion is a functional disorder of the stomach. (A functional disease is one in which no structural change can be found, but which yet gives rise to pain, loss of power, or other symptoms; an organic disease is one where there is a change in the structure of the organ or tissues affected; cancer of the stomach is an organic disease.) Dyspepsia may be due to a disorder of the gastric secretions or of the muscular movements of the stomach.

The symptoms of dyspepsia are pain in the upper part of the abdomen after taking food; it may also be felt in the left side, and in the back between the shoulder blades. There is flatulence, or excessive formation of flatus, and eructations. There is distension about the region of the stomach, the patient cannot bear any pressure from tight waistbands. He suffers from nausea and vomiting. There is a furred tongue, constipation, and anæmia.

Dyspepsia is caused by too much food, or by a constant excess in the amount of tea or alcohol consumed. Bad teeth often lead to it, by the patient bolting his food whole in consequence of not being able to masticate it. For the same reason hurried meals cause indigestion—pork, veal, and other indigestible food, cause it, and irregularity in the time of taking meals.

All the organic diseases of the stomach may cause dyspepsia, besides weakness of the walls of the stomach and displacement of the stomach, such as is produced by pregnancy and abdominal tumours. If the stomach secretes too little pepsin or hydrochloric acid or too much mucus, dyspepsia follows. It also frequently accompanies general illnesses, such as anæmia, phthisis, and the infectious fevers, which affect the secretions and the mobility of the organ.

The treatment of acute dyspepsia aims at getting rid of the irritating food by inducing vomiting, after which no food should be given for several hours. A little milk and soda may then be taken, and afterwards light food for a day or two, such as soles, whiting, and other white fish. Tea and alcohol are to be avoided.

In **chronic dyspepsia** the teeth must be put in order, if necessary, and the patient must take regular meals of suitable food. By exercise and other means he must overcome the constipation which usually accompanies dyspepsia. The drugs generally given are bismuth, bitters, or mineral acids.

Gastric ulcer = ulcer of the stomach. The symptoms are pain just below the ensiform cartilage (that is, the cartilage of the lower end of the sternum), of a burning tearing character, brought on by food. It does not begin till an hour or two after taking food, but it is very severe, and is often accompanied by pain in the back. The pain may continue till it is relieved by *vomiting*, which is another symptom of gastric ulcer. Very often blood is vomited, sometimes in small quantities, in which case the gastric juice acts upon it, and the vomit looks like coffee-grounds, or the sediment of beef-tea; but when the ulcer has eaten away the coat of an artery, the blood is poured out in large amount, and is vomited at once, perhaps two or three pints at a time. Some of the blood poured out into the stomach passes into the intestine, and melæna, black tarlike motions, are passed. *Constipation* frequently accompanies gastric ulcer.

It is a disease which lasts a long time. Sometimes patients entirely recover from it; but there are less favourable terminations. The ulcer generally occurs near the small end of the stomach, the pyloric end; and if, in healing up, it contracts this narrow opening, there may be dilatation of the stomach, in consequence of the difficulty of the food passing through the pylorus. The ulcer may also perforate the coats of the stomach, and thus allow the gastric contents to pass into the abdominal cavity, and cause acute peritonitis. This brings about a fatal termination, except in cases treated surgically, which sometimes recover.

The treatment is to keep the patient in bed, to give strict milk diet only, and if there is hæmatemesis to give no food except per rectum. When drugs are given, they are generally bismuth and morphine.

Cancer in the stomach occurs in patients older than those who suffer from gastric ulcer, the usual age being from forty to sixty.

If it affects the pyloric end, it causes stricture, so that the stomach becomes dilated, as its contents cannot pass the obstruction. At first the symptoms are the same as those of dyspepsia, afterwards there is abdominal pain and much wasting, and vomiting of a large amount, a gallon or more every two or three days. The vomit is often frothy and dark brown in colour, and sometimes blood is mixed with it. The abdomen becomes distended, peristalsis is visible, melæna is sometimes present, and the patient has a characteristic sallow complexion. The duration of the disease is from six months to two years; it is always fatal.

The treatment is by careful diet—whatever it is found that the patient can take best,—generally light food, such as peptonised milk, eggs, oysters, chicken, white fish, etc. The vomiting can be treated by ice, swallowed whole, and effervescing medicines, drunk while effervescing. Morphine and opium are given to relieve the pain. Patients are often greatly relieved by the daily washing out of the foul contents of the stomach, as it removes the nausea and vomiting and improves the appetite. A long tube with a hole at one side of the closed end is passed down the throat into the stomach, and by means of a funnel warm water is poured through into the stomach. About a pint at a time is used, and is then allowed to return into a basin on the floor, through the tube, which acts as a syphon.

Sometimes an operation is performed. Either the diseased part of the stomach is removed (pylorectomy), or a new opening is made between a healthy part of the stomach and the small intestine (gastro-jejunostomy), so that the food need not pass through the pylorus.

Appendicitis is inflammation of the appendix from foreign bodies blocking it and causing inflammation, ulceration, and possibly perforation or gangrene. The appendix may perforate through into the peritoneal cavity, and cause general peritonitis, or adhesions may form round the appendix, and cause a local abscess which will produce local peritonitis.

The symptoms are a rapid onset, with pain in the right iliac fossa (the lower right side of the abdomen). The temperature

rises; there is nausea and sickness, with constipation, and the abdomen is distended.

Treatment.—Complete rest must be given to the intestine, and the patient must lie perfectly still in bed, with hot fomentations applied for relief of the severe pain. Only milk diet is given. The patient must on no account take any purgatives, nor be allowed to strain at all. The doctor will probably give him opium, and if an abscess has formed, it will be opened.

Intestinal obstruction is acute or chronic. There are various causes of acute obstruction. The intestine may be blocked by a foreign body, such as a large gall stone.

Other forms are intussusception or invagination, volvulus, which is a twisting of the intestine on its longitudinal axis, strictures, strangulation from bands or through apertures, and kinking.

The symptoms are intense pain about the umbilicus, vomiting, first the contents of the stomach, then bile, and then the fæcal contents of the intestine. The abdomen becomes tense, no fæces or flatus is passed, the patient lies in a collapsed condition, with a feeble pulse and a dry, furred tongue. The urine is scanty, and he suffers much from thirst. If nothing is done he will live only a few days.

Treatment.—The patient must be kept in bed, fed by nutrient enemata, and the pain relieved by hot fomentations. Opium will probably be given, and an operation is performed as soon as possible.

The commonest form of obstruction in children is **intussusception**. A piece of intestine slips into the portion immediately adjacent, so that there are three layers of intestine, one within another. It generally happens that a piece of the small intestine slips into the cæcum.

The symptoms are sudden pain, griping and nausea, and vomiting. Blood and mucus are first passed, and there is constipation, with the frequent, painful, resultless straining that is called tenesmus. There is collapse, with its small, weak pulse. The abdomen is distended, but the tumour formed by the intussusception can be felt as a sausage-shaped swelling.

Treatment.—Air or water is injected by a suitable tube into

the rectum, with the object of reducing the intussusception —*i.e.* of forcing the intestine backwards out of the part into which it has slipped. If this fails, an abdominal section may be necessary.

Chronic obstruction comes on more slowly. It may be caused by an accumulation of fæces which cannot be removed, or by stricture, or by chronic intussusception. There is frequently constipation, but there may be diarrhœa in addition, as some of the fluid contents of the bowel can pass the accumulation of hard fæces. Sometimes the motions are flattened and ribbon-like, in consequence of the constriction moulding them to that shape. There is a good deal of pain, and sometimes vomiting.

Treatment.—Careful diet, such food as will easily be digested, and pass the obstruction, laxative medicines and frequent enemata. Sometimes resort is had to colotomy—that is, an artificial anus is made above the seat of the stricture.

Intestinal worms.—There are three common kinds—thread, round, and tape worms.

The tape-worm is a flat ribbon-shaped worm, very narrow at one end, and broader at the other, several feet in length, and made up of many segments or joints, four or five hundred of them, of which the largest are about half-an-inch long and quarter-of-an-inch broad. It inhabits the small intestine. The head, which is the size of a pin's head, is fixed in the mucous membrane, and the lower segments may be passed with the fæces. The tape-worm is introduced into the body by eating measly pork.

There may be no symptoms, but there may be gnawing, colicky pains, irregularity of the bowels, a voracious appetite, itching of the nose, and headache and depression.

The treatment is to get rid of the worm by a purgative. No food should be taken after the early evening, and a dose of castor-oil is given at bedtime. A dose of male fern is given before breakfast, and a few hours afterwards purges are administered. The motions should be examined for dead worms, and saved for the doctor to see.

The round worm is somewhat like a garden worm, and is from

eight to twelve inches long. It is of a pink colour, cylindrical in shape, and tapering at the ends. It inhabits the small intestine, but it occasionally reaches the stomach and is vomited. Sometimes it is passed per anum. The number present in the body varies; there may be only one, or as many as forty or fifty.

The symptoms of round worms are a feeling of nausea, foul breath, an irregular appetite, itching of the nose, and fits.

The earth worm is redder in colour, less tapering, and has bristles along its sides.

Treatment.—A dose of santonin is given on bread and butter for three or four mornings in succession, and is then followed by a calomel purge.

The thread worm resembles a piece of thread, being about half-an-inch in length, and of very small diameter. It inhabits the large intestine, especially the rectum, and is found in the fæces. It causes heat and itching at the anus, especially at night. The bladder is irritable and micturition frequent, and there is prolapse of the anus and tenesmus.

The chief purgative used in treatment is calomel, but rectal injections of quassia, salt, or tannin, are often ordered in addition.

CHAPTER XXIV

RESPIRATION

THE maintenance of animal life necessitates the continual absorption of oxygen and the excretion of carbonic acid. The blood is the medium by which this exchange takes place. The blood absorbs the oxygen from the air and conveys it to all parts of the body; and by the blood the carbonic acid which comes from within the body is carried to those parts where it may escape from the body—namely, the lungs and the skin.

Respiration, therefore, is the process by which oxygen is absorbed by the blood through the lungs, while carbonic acid and water are at the same time excreted.

All vertebrate animals have lungs or gills which bring the blood in contact with air or water, as the case may be. In frogs the skin is also used in respiration as well as the lungs.

A lung is made of a fine transparent membrane, one side of which is exposed to the air or water, while the other side is a network of blood-vessels.

The lungs are only the medium of exchange on the part of the blood of carbonic acid for oxygen. The carbonic acid is not produced in the lung.

The Respiratory Passages

As respiration is the process by which this interchange of gases takes place in the lungs, the atmospheric air must pass into them and be expelled by them.

The lungs are contained in the chest or thorax.

The thorax is a closed air-tight cavity, occupied by the heart, lungs, and great blood-vessels. The inner walls of the chest and the lungs are covered with a serous membrane, the pleura. (A

serous membrane is one which secretes a little clear fluid in the closed sac which it lines.)

The walls of the thorax are made up of twelve pairs of ribs, connected with each other by the intercostal cartilages, and the sternum, and the twelve dorsal vertebræ.

The cavity of the thorax is cut off from the abdominal cavity by the great muscle called the diaphragm. Through the diaphragm pass the œsophagus, the aorta, and the superior and inferior vena cava.

The air passes through the nostrils, or mouth, or both, then through the pharynx and larynx into the trachea or windpipe, which divides inside the chest into the two bronchi, one bronchus going to each lung.

The larynx or voice-box is the upper part of the air passage. It is formed of cartilage, and is lined by mucous membrane and contains the vocal cords, by the vibration of which the voice is produced. The vocal cords are attached to cartilages which can be moved by muscles, and they can be so closely brought together as to close the entrance of the larynx. The epiglottis is a leaf-shaped cartilage which closes over the glottis (the opening into the larynx) during the act of swallowing.

The trachea or windpipe extends from the lower part of the larynx. It is a membranous tube, supported and kept open by a series of imperfect cartilaginous rings of about two-thirds of a circle, which are connected behind by fibrous muscular tissue. The trachea is about four and a half inches long. The bronchi, into which it divides, are made up, in the same way as the trachea, of cartilage aud fibrous tissue. As they enter the right and left lung respectively, they divide and sub-divide into smaller and smaller branches, until they terminate in the lobules of the lung, gradually losing their cartilage as they become smaller.

The lungs occupy the greater part of the chest. They are large, light, pinkish organs which surround the heart. They weigh about twenty-four ounces, and are not equal in size, the right being the larger. Each is enveloped in a serous membrane, the pleura, which also lines the inner surface of the thorax. These layers of pleura are in contact, and in a healthy condition they are

lubricated by just sufficient fluid to ensure the easy movement of the lungs during their expansion and contraction. If an opening is made in the chest wall, the air gets into this space between the layers of pleura, which ought to be air-tight, and the lung collapses.

The lungs are divided into lobes; the right lung has three lobes, the left two. Each lobe is made up of smaller parts called lobules, and each of these lobules contains—

1. A branch of the bronchial tube.
2. Air-cells.
3. Blood-vessels.
4. Nerves.
5. Lymphatics.

The smaller bronchus divides and sub-divides on entering a lobule, and becomes thinner and thinner, until it is only a delicate membrane. The end of each terminal branch widens out, the walls being pouched into smaller dilatations called air-cells. The funnel-shaped terminal is called an infundibulum. The walls of the air-cells are composed of fibrous and muscular tissue, and are lined on the inside with a network of minute blood-vessels, and covered with epithelium. It is in these capillaries that the change takes place from venous to arterial blood.

The lungs receive blood from the pulmonary artery and the bronchial arteries. The pulmonary artery carries venous blood from all parts of the body to the lungs for its arterialisation. The bronchial arteries bring nutrition to the lung tissue.

The act of respiration consists of the alternate expansion and contraction of the thorax, by means of which the air is drawn into and expelled from the lungs. These acts are called inspiration and expiration.

For inspiration of air into the lungs it is necessary to increase the size of the thoracic cavity, so that the pressure of the air in the lungs will be diminished, and a fresh quantity of air will enter through the larynx and trachea to equalise the pressure.

For expiration the size of the thorax must be diminished, so that the air will be driven out of the lungs.

Inspiration is a muscular act. The action of the inspiratory

muscles increases the size of the chest cavity in every direction. It is increased vertically (straight up and down) by the contraction of the diaphragm, which flattens down in contracting; and it is increased from side to side and from front to back by the raising of the ribs by their muscles (the intercostal muscles and the levatores costarum).

As the cavity enlarges, a sort of vacuum is created in the pleural cavity, which is counteracted by the pressure of the external air, so that air rushes down through the mouth and nose into the pharynx, larynx, trachea, bronchi, and bronchial tubes.

In forced inspiration, as in violent exercise, or when there is an obstruction to the entry of air, other muscles also act—viz. the muscles of the back and neck, and the muscles of the nose. These are called accessory muscles of respiration.

Expiration is effected by the elastic recoil of the chest and lungs, and is due chiefly to the return of the lungs, ribs, and diaphragm to the condition they were in before inspiration. There is also a forced expiration, which is effected by the internal intercostal muscles, the abdominal muscles, and the muscles of the back.

In the respiration of men the diaphragm acts chiefly, and the abdomen moves a good deal; this is the abdominal type of breathing. Women use the abdomen less and the ribs more, which is the costal type.

The lungs hold 225 cubic inches of air. The normal rate of respiration is eighteen in a minute, but this is increased by exertion and disease. Only a small amount of air, from twenty to thirty cubic inches, are expired and inspired at each breath. Even after a deep expiration from seventy-five to a hundred cubic inches of air remain in the lung and cannot be got rid of. This air which is left is called the residual air.

Respiratory Changes in the Air

	Pure air contains	Respired air contains
Oxygen	20·61	16·26
Nitrogen	77·95	77·95
Carbonic Acid	0·04	4·39
Aqueous Vapour	1·4	1·4

The changes which take place when air has been breathed are the following:—

1. The air is heated by its contact with the mucous membrane of the nose, pharynx, larynx, trachea, and lungs. Its temperature becomes nearly that of the body, from 97° to 99·5°.

2. It gains about five times its original amount of carbonic acid, containing 4·39 parts instead of 0·04.

3. The oxygen is diminished, and its diminution is more or less in proportion to the increase of carbonic acid.

4. The volume of air expired in a given time is less than that inspired, which is due to the absorption of slightly more oxygen than is expired in the carbonic acid.

5. The watery vapour is increased, and as a rule is sufficient to saturate the expired air. In twenty-four hours, from seven to ten ounces of water are exhaled in the breath.

6. A small quantity of ammonia is added to the ordinary constituents of expired air.

7. The quantity of organic matter is slightly increased, about three grains in twenty-four hours.

Changes in the Blood during Respiration

The blood absorbs oxygen from the air, and gives up carbonic acid to the air in the alveoli—the small air-cells. We must remember that not all the air in the lungs is expelled during expiration, only the tidal air, and that the air in the air vesicles mixes with the new air, and is thus expelled during expiration, so that most probably there is less oxygen in the air in the alveoli than there is in the ordinary expired air. From this air the blood takes up eight or ten parts of oxygen to every hundred parts of blood, and this represents the difference in the amount of oxygen in venous and arterial blood. The oxygen is not simply dissolved in the blood, but it is taken up by the hæmoglobin in the red corpuscles. The carbonic acid is given up in the air in the alveoli by diffusion.

The blood in its course through the lungs is exposed for a few seconds to the air, with only the thin walls of the capillary and

the air-cell between. The veins collect the blood and convey it to the left auricle.

The blood changes during respiration—

1. In colour. The dark crimson of venous blood is changed to the bright red of arterial.

2. It gains oxygen.

3. It loses carbonic acid.

4. It becomes slightly cooler.

5. It coagulates sooner and more firmly.

The oxygen combines with the hæmoglobin in the red blood corpuscles, and is then carried in the arterial blood to all the tissues in the various parts of the body, and is brought into close contact with the tissues. A certain amount of oxygen is used up in the tissues to maintain the heat and nutrition of the body, and a certain amount of carbonic acid and water is excreted into the blood. The new formed carbonic acid is carried by the venous blood to the lungs, where it passes into the air through the walls of the alveoli and is thence expired, the blood taking up in exchange a new supply of oxygen.

Effects of vitiated air.—As the air expired contains an excess of carbonic acid and organic matter and a deficiency of oxygen, if the same air be breathed over and over again the proportion of carbonic acid and organic matter will increase till the air is not fit to be breathed; but, before this occurs, headache and a feeling of oppression and languor will be felt. Therefore it is of the greatest importance that there should be a constant supply of fresh air, and the removal of that which is vitiated.

Special Respiratory Acts

1. Sighing is a prolonged inspiration, the air passes almost noiselessly through the glottis, and is expelled rather suddenly by the elastic recoil of the lungs and chest wall.

2. Hiccough is an inspiratory act. It is sudden, in consequence of the sudden and spasmodic contraction of the diaphragm, and the air rushing suddenly through the glottis causing vibration of the vocal cords and the peculiar sound.

3. Coughing is a deep inspiration followed by expiration; but the latter is obstructed by the momentary closure of the vocal cords. The abdominal muscles then contract strongly and push the abdominal viscera against the diaphragm, and thus make pressure on the lungs until the force is sufficient to separate the vocal cords.

4. Sneezing is much the same as coughing, but the air is forced through the nose instead of the mouth.

5. Speaking is the voluntary expiration of air through the glottis by means of the expiratory muscles. The vocal cords are put on the stretch in a proper state of tension for vibrating as the air passes over them. The sound is moulded into articular speech by the lips, tongue, teeth, etc.

6. Sniffing is produced by rapid incomplete action of the diaphragm and other inspiratory muscles. The mouth is closed, and all the air enters by the nose.

7. Sobbing is a series of convulsive inspirations which take place while the glottis is more or less closed.

8. Laughing is caused by a series of short and rapid expirations.

9. Yawning is an involuntary act of inspiration, the mouth often being wide open and the limbs stretched.

CHAPTER XXV

DISEASES OF THE RESPIRATORY APPARATUS

IN nearly all these diseases, one of the most noticeable symptoms is **dyspnœa**, or difficult breathing. The normal number of respirations in a minute is eighteen, but this number is often increased, and may reach thirty, fifty, or even, in extreme cases, a hundred respirations per minute. Breathing in dyspnœa is also more shallow in character, and the accessory muscles of respiration are brought into action, the alæ nasi, and the muscles of the neck, and there is "sucking in" of the lower intercostal spaces—*i.e.* if you look at the lower part of the chest, you will see the skin between each rib drawn inwards with every inspiration.

Dyspnœa may be caused by obstruction in any part of the respiratory passages. In the nose the obstruction may be from new growths, such as polypi or adenoids; in the pharynx it may be from enlarged tonsils, and in the larynx, either from inflammation (laryngitis) or diphtheria. If the respiration is very difficult and is accompanied by a whistling sound, the obstruction is likely to be high up, and is probably in the trachea. Dyspnœa is also caused by diseases of the bronchi, such as bronchitis and asthma, where it is less the inspiration than the expiration which is difficult and prolonged. Diseases of the lung also cause dyspnœa—*e.g.* pneumonia, broncho-pneumonia, and phthisis.

Another alteration in the respiration is known as **Cheyne-Stokes breathing**. The respiration ceases for a time, perhaps for ten, fifteen, or twenty seconds, and then begins again, at first rapid and shallow, afterwards deeper and slower until it ceases again for an interval. This occurs in some cases of lung and heart disease, and in some diseases of the brain, as meningitis. It is a bad symptom, as patients who begin to breathe in this way seldom recover, though they may live on for months.

Asphyxia or suffocation may occur in diseases of the respiratory

organs from the prevention of the entry of a sufficient amount of oxygen into the blood, either by the direct obstruction of the larynx or trachea or other parts of the respiratory system, or by the introduction of a gas devoid of oxygen into the lungs instead of air. Thus asphyxia may be caused by inhaling the fumes of charcoal or of coal gas.

Another symptom to be observed is **cough**. Coughing consists of a sudden violent forcible expiration, in which the air is expelled with a noise through the larynx. The object is generally to expel something from the air passages, but the cough is also sometimes purely nervous.

Different diseases of the respiratory system are characterised by different coughs. In disease of the larynx the cough is generally dry, hoarse, and irritating. If the bronchi are affected it is moist and attended with wheezing, and disease of the pleura causes a short, sharp cough which is accompanied by pain in the side.

In whooping-cough the air is expelled from the lungs by a number of sudden short expirations, and then a long-drawn inspiration accompanied by a whoop puts an end to what appears to be impending suffocation. This cough often ends in vomiting.

In aneurism of the aorta the cough is of a curious harsh metallic character, and is known as a "brassy" cough. The aneurism causes obstruction by pressing from outside on the trachea or some other respiratory organ.

Hæmoptysis—the spitting of blood—occurs in phthisis and in some forms of heart disease. The blood is coughed up, often quite suddenly, without any warning, or it may be preceded by a tickling in the throat. Patients who have once had hæmoptysis can sometimes tell when it is coming on again. The blood is bright red in colour, and frothy and mixed with the sputum. The sputum continues more or less blood-stained for some days after an attack of hæmoptysis, and as it grows less it becomes of a dark reddish brown colour.

Hæmoptysis in phthisis is due to the destructive process in the lung ulcerating through some blood-vessel. It is sometimes fatal at once, the patient being choked by the sudden quantity of blood poured out of a large vessel.

The treatment is complete rest in bed. The patient must not be allowed to move or to talk, and must not sit up in bed for any purpose. He should be given ice to suck, and may have an ice-bag placed on his chest. Very little food should be given for several hours after the attack, and then the diet must be light, milk, beef-tea, etc. Nothing hot may be given. The bowels must be kept open, by "white mixture" or some other aperient, and opium, ergot, etc., are likely to be also ordered, to act as hæmostatics—*i.e.* agents to stop the hæmorrhage.

The **sputum** is a very necessary symptom for the nurse to notice. It must be saved for the inspection of the physician, and patients must be provided with spittoons, and not allowed to spit into handkerchiefs, etc. The quantity and character of the sputum vary much in diseases of the respiratory tract. There is a great difference in the sputa of the various forms of bronchitis. In acute bronchitis the expectoration is viscid, white and scanty at first, and later on abundant, yellow or green in character.

In chronic bronchitis it is copious, greenish or yellow in colour, and very frothy.

In fœtid bronchitis it has a very foul odour, and arranges itself in three layers in the spittoon; frothy at the top, then serous and thin, and thick dirty grey pus at the bottom.

In bronchiectasis a very large quantity of sputum is coughed up at once, generally in the early morning soon after the patient wakes. The bronchial tubes are dilated, and during the night the secretion is collected in the tubes, and is all got rid of together, sometimes several ounces at a time. It is often foul-smelling. A large quantity is also brought up in the case of empyema, when the abscess eats through the pleura, and finding its way into the lung, is coughed up through the bronchial tubes.

There is a rare form of bronchitis, called plastic bronchitis, in which the patient coughs up rounded masses of a whitish colour, which, when carefully washed out in water, are seen to be casts of the bronchial tubes.

The sputum of asthma is a thin transparent mucus.

In phthisis (consumption) it is purulent—*i.e.* it contains pus, it

is green or yellowish in colour, and may contain blood. It comes up in round masses like coins, and is therefore called nummular. It is generally very abundant.

The sputum of pneumonia is very characteristic of the disease, of a rusty brown colour, viscid, and so tenacious that the vessel containing it may be turned upside down without its flowing out.

Gangrene of the lung produces a dirty grey sputum, with a fœtid smell, which also affects the breath of the patient.

Diseases of the Respiratory Tract

Catarrh, or common cold, is an inflammation of the mucous membrane of the nose, which may spread to the pharynx, larynx, or bronchi. It arises from exposure to cold or draughts, from getting wet and sitting in damp clothes and shoes. The symptoms are sneezing, chilliness, dry throat, general indisposition and loss of appetite, headache, discharge of mucus from the nose, and a feeling of stuffiness and deafness. If the inflammation spreads to the larynx there is also hoarseness and cough. The best treatment is to avoid the cause of the cold, but when it has begun, free sweating at night should be promoted by giving a hot bath and diaphoretics—*i.e.* medicines to increase the action of the skin, and putting extra blankets on the bed, or a hot bottle.

Hay Fever gives rise to symptoms very much like those of an ordinary cold. It occurs in the early part of the summer, when grasses and other plants are flowering, and is due to the pollen grains that float in the air coming in contract with and irritating the mucous membrane of the nose, eye, throat, etc. Some persons are particularly susceptible to it. Local applications of cocaine to the eye, nose, etc., give some relief.

Laryngitis is an inflammation of the mucous membrane of the larynx. It arises from many causes, and occurs in the course of many diseases. Exposure to wet and cold produces laryngitis, or the inhaling of irritating vapours may cause it. Foreign bodies in the larynx, extension of inflammation from other parts, tubercle, cancer, and measles, are other causes.

Costermongers, public speakers and clergymen are liable to a form of chronic laryngitis, from using the voice too much.

The symptoms of laryngitis are hoarseness, pain in the larynx, and fever. There is some dyspnœa, and there may be aphonia (loss of voice). In severe cases the nurse must note carefully the general condition of the patient. The indications for sending for immediate medical assistance would be an increased rate of pulse or respiration, blueness of the face and hands, and coldness of the extremities.

The patient must be kept in a moist, warm atmosphere, about 65 degrees. A bronchitis kettle should be kept boiling near his bed, and inhalations of steam containing compound tincture of benzoin may relieve his symptoms. The diet must be entirely liquid.

Laryngeal obstruction arises from a foreign body, as a coin or a bead, in the larynx; or the obstruction may be the swelling and membrane of diphtheria, or a growth, or œdema or paralysis of the vocal cords, etc.

Any of these obstructions give rise to very urgent dyspnœa and great distress; the breathing is loud and stridulous (with a harsh sound); if you look at the chest, you will notice sucking in of the intercostal spaces. The child is restless, clutching at its throat, as if it would try to remove whatever is hindering its breathing. His complexion becomes ashy white, and his eyes are prominent, and there is sweating, especially about the forehead. The child must be watched carefully, without intermission, as at any time tracheotomy may become necessary.

Laryngismus stridulus—child-crowing—occurs in babies from three months to two years old. Ricketty children, and children who are badly fed and cared for, are more subject to it than those in good circumstances. Teething appears to be a pre-disposing cause.

The attack begins with an occasional slight crowing sound, after a time the respiration ceases, and the child lies with the head thrown back, with a pale face, the chest fixed, and some twitching of the facial muscles. Then suddenly the spasm ceases, the air enters the glottis with a loud crowing sound, and the child appears perfectly well until the next attack.

Bronchitis—inflammation of the mucous membrane of the bronchi—occurs especially in children and in old people, and is a much more fatal disease with them than with people of middle age. It follows exposure to cold or wet, and it may be set up by the inhalation of irritating vapours (such as a smoky London fog). It constantly occurs in typhoid, diphtheria, whooping-cough, measles, and influenza, and patients suffering from Bright's disease are very subject to it.

An attack of acute bronchitis begins with a feeling of tightness in the chest, cough, and a thin scanty sputum, and wheezing and dyspnœa. The temperature is a little over 100 degrees, the appetite is lost, and the tongue is furred. It may subside, or may go on to the chronic form.

Capillary bronchitis is a very severe form of bronchitis. It affects the small bronchial tubes, and gives rise to great dyspnœa, cyanosis, and weakness. The temperature is often raised to 103 or 104 degrees, the pulse is feeble, and the termination is often fatal.

Other varieties of bronchitis are the chronic, fœtid, and plastic forms.

The treatment for them all is about the same. The room must be kept warm, and the atmosphere moist by means of a bronchitis kettle. A mustard leaf to the chest often gives relief, and a hot linseed poultice relieves the feeling of tightness in the chest. A cotton-wool jacket is sometimes used in place of a poultice. Stimulants are given in capillary bronchitis, and in all forms the drugs chiefly used are carbonate of ammonium, ipecacuanha, and squills. The diet must be light. The patient should be very careful during his recovery to avoid draughts and anything that is likely to bring on another attack.

Asthma is due to spasm of the bronchial tubes, which produces sudden attacks of dyspnœa. It is sometimes a hereditary disease, but it may be caused by growths in the nose, such as adenoids and polypi; it often follows measles and whooping-cough in children, and gouty people are subject to it. A particular climate often brings on an attack; for instance, some asthmatic people are free from it in London, and cannot live in the country, while just

the opposite is the case with others. Smoke, or certain odours, or errors of diet may lead to it.

The patient may feel some discomfort, and suffer from drowsiness and sneezing before the actual attack comes on. But it more often begins quite suddenly in the early morning between two and four, when the patient wakes scarcely able to breathe, gets out of bed to open the window, and grasps the side of the bed to help the accessory muscles of respiration. Expiration is very long, and accompanied by a loud wheezing. The eyes are widely opened and prominent, the face is cyanosed. Towards the end of the attack there is cough, with expectoration of thin transparent mucus.

Treatment.—Change of air is often beneficial, and attention should be paid to regulating the diet. Surgical treatment may be necessary if the attacks arise from nasal obstruction. Lobelia and iodide of potassium are often given in asthma, and the patient may find relief from smoking stramonium cigarettes or from inhaling the smoke of nitre paper. Nitrite of amyl is sometimes inhaled also.

Pneumonia.—Inflammation of the lungs. The lung becomes solid by reason of the air-cells being filled up with imflammatory products, therefore the affected part cannot take in any air and is useless for breathing.

It is called lobar, because it affects a large area of lung. It is known as double pneumonia when both lungs are affected. It is due to the invasion of a germ which sets up inflammation in the lung. These germs multiply rapidly, and besides filling up the air-cells they produce during their growth a poison which gives rise to the symptoms, pyrexia, headache, etc.

Pneumonia is more common in males than in females, perhaps because they are more exposed to bad weather, and more addicted to intemperance, which is a great cause of pneumonia.

There is a quite sudden onset in pneumonia, generally a rigor, when the temperature runs up to 103 or 104 degrees, and remains at about the same for six or eight days, when it suddenly drops to below normal by crisis, or it may fall more gradually. The respiration is quick, from 40 to 80, and is out of all propor-

tion to the pulse, which is generally about 100, except in severe cases. The patient loses his appetite, has a furred tongue, and complains of headache and pain in the side. The sputum is rusty, and the skin is hot and dry, with a peculiarly burning feel; and herpes, a little vesicular eruption, is to be seen about the lips and nose. The face is flushed, and the cough short and irritating. He may not be able to lie down in bed.

Pneumonia is likely to come to a favourable termination in children and young adults. The presence of herpes is, for some unknown reason, a good sign, and the smaller the area of lung affected, the more likely the patient is to recover.

But the prognosis is bad in old people, and in drunkards, and also if the disease occurs in people suffering from other diseases, such as nephritis. It is also bad if both lungs are affected, if the patient is delirious or cyanosed, and if, in an adult, the pulse rises above 120 per minute and the respiration continues for some time above 60.

The patient must be kept entirely in bed, as quiet as possible, and must not be sat up in bed, unless that is the only position in which he can breathe comfortably. If he is very delirious he may need restraint, but as little force as is possible must be used for the sake of saving his strength.

He will want plenty of liquid nourishment, milk, broth, beef-tea, and jelly. Old people, those addicted to alcohol, and cases of cardiac failure will need stimulants.

Salines and diaphoretics are the medicines given. If there is much pain and sleeplessness opium is given, generally in the form of Dover's powder. When the temperature is very high the patient may be sponged; and an ice poultice to the chest will sometimes bring down the temperature. In extreme cases, where there is much blueness and distress of breathing, venesection is performed.

Broncho-pneumonia.—In this disease there are small patches of consolidation in the lung; the small bronchi become inflamed, and the inflammatory products fill the lobules, which should contain air.

Children and old people chiefly suffer from it. It often follows

bronchitis, whooping-cough, diphtheria, scarlet fever, and measles.

In a child with bronchitis the symptoms become exaggerated as the broncho-pneumonia begins, the temperature rises, and the respirations are increased.

The temperature is intermittent—*i.e.* it does not keep up at about the same point for several days, as in lobar pneumonia, but rises and falls two or three degrees daily. The attack may last a day or two, or for as long as six weeks. The pulse and respiration are quick, and the child looks pale and livid. The temperature falls by degrees, and does not end by crisis, as in pneumonia.

The sick-room should be kept warm, about 65 degrees, and the diet must be liquid. If much bronchitis is present a steam kettle must be kept boiling in the room, and a cotton-wool jacket or a jacket poultice put on. When the temperature keeps high an ice-bag or ice-poultice should be applied.

The drugs given are expectorants, carbonate of ammonia and ipecacuanha.

Phthisis (wasting) is the disease commonly known as consumption.

It is due to a germ or micro-organism, the tubercle bacillus, which invades the lungs and sets up irritation, which results in the formation of tubercles. Inflammation accompanies it, and the lungs become solid, afterwards breaking down and suppurating, thus forming cavities. An important result of this destruction is the hæmorrhage which follows in consequence of the walls of the pulmonary blood-vessels being ulcerated through. Phthisis generally affects first the apex of the lung.

Associated with the disease in the lungs is disease of the larynx, ulceration of the intestine, and fatty disease of the liver.

Causation of phthisis.—Tubercle only develops when the bacillus meets with conditions favourable to its growth. The children of phthisical parents are more liable to it than others, and any bad condition of living may lead to it, such as overcrowding in badly ventilated rooms, exhausting work with insufficient food, frequent child-bearing, and exposure to wet and

damp. Drunkards are liable to phthisis, and it especially follows some diseases—*e.g.* typhoid, diabetes, and pleurisy.

The symptoms of phthisis are cough, dyspnœa, expectoration, and emaciation. The temperature is hectic; it varies much in the course of the day, often rising from a normal morning temperature to 102 or 103 degrees by six in the evening. Hæmoptysis is a frequent symptom, and there are profuse night sweats, loss of appetite, and anæmia. Sometimes there is severe diarrhœa.

Pure air is of the greatest importance to phthisical persons, hence they are often sent on a sea voyage, or to some mountain resort. They must have good food and sufficient exercise. Cod-liver oil is the medicine most used, either with or without iron. Cough mixtures containing a little opium are also given, and atropine if the night sweats are very distressing. Opium and ergot are used when there is hæmoptysis. Tuberculous ulceration of the larynx is treated by insufflation (blowing down) of morphine and iodoform in powder, or by painting the ulcers with lactic acid (50 per cent.).

Pleurisy is inflammation of the pleura. There are three varieties, dry pleurisy, pleurisy with effusion, and purulent pleurisy or empyema. It follows cold or such an injury as a fractured rib. It almost always accompanies pneumonia and phthisis, and is frequent in fevers and in Bright's disease.

The attack comes on with a feeling of chilliness or a decided rigor. There is a severe pain in the side, which is aggravated by any movement, especially by coughing. The temperature rises, and the appetite is lost and the tongue furred. If there is fluid in the chest there is a good deal of dyspnœa, and a quick pulse. The patient lies on the affected side, and becomes very weak.

The fluid is often purulent in children, and empyema may also follow an acute fever like pneumonia; it is also common in septic disease. The temperature is hectic in empyema, and there may be a sudden expectoration of pus. A needle is frequently put into the chest to ascertain if the effusion is simple clear fluid or if it is pus. The fluid in simple effusion is drawn off with an aspirator, but for empyema an operation is necessary. The chest is opened, and sometimes a piece of rib removed, to make room

for a drainage tube, which has to be left in until the chest is clear of fluid.

The treatment of pleurisy is rest in bed and light diet. The pain is relieved by poultices, cupping, strapping, or counter-irritation. Diaphoretics and purgatives are given.

CHAPTER XXVI

THE CIRCULATION

THE blood is the most important fluid in the body, because it is the nutritive fluid.

It has five chief functions—

1. It nourishes the various tissues.

2. It carries the oxygen derived from the air during respiration to the various tissues, and by its chemical combination with other elements maintains the heat of the body and develops the nervous, mental, and other forces.

3. It warms and moistens all parts of the body.

4. It receives the waste products, and conveys them to the various excretory organs (lungs, kidneys, etc.), by means of which they are removed from the system.

The carbonic acid is got rid of by the lungs during respiration. The nitrogenous products are removed by the kidneys, water and some carbonic acid by the skin.

5. It supplies the various secreting glands of the body, so that they secrete the fluids necessary for digestion and other functions.

Blood appears to the naked eye to be a bright scarlet colour; it is somewhat viscid, and has a salty taste, and a distinct characteristic odour. It is heavier than water.

In a healthy state the blood is contained in the heart and the blood-vessels, the arteries, veins, and capillaries. About half the blood in the body is of a dark purplish colour and contains an excess of carbonic acid; this is called venous blood, and is contained in the veins and the pulmonary arteries. The other half of the blood is in the arteries and pulmonary veins; it is of a bright scarlet colour, and contains an excess of oxygen. It is called arterial blood. But if venous blood is shaken up with oxygen it becomes arterial in character.

If blood is magnified, it is seen to be made up of a number of

little round bodies floating in a colourless fluid which is called the plasma of the blood. These little bodies are corpuscles, of which there are two kinds, the red corpuscles and the white.

The red blood corpuscles are very small, about $\frac{1}{4000}$ of an inch across, and a cubic inch of blood contains about eighty million red corpuscles. The colouring matter of the blood, which is called hæmoglobin, is contained in these red corpuscles. Their chief function is to act as carriers of oxygen. They absorb oxygen in the lungs, and carry it and give it up to the tissues. The hæmoglobin not only has the power of taking up the oxygen and giving it up again to the tissues, but it actually combines with the oxygen.

The white corpuscles are less numerous, there being only about one white to 500 red corpuscles.

The blood-plasma, or liquor sanguinis, is the transparent, clear, colourless, saline, albuminous fluid in which the corpuscles float. It consists of water, fibrin, albumen, and salt.

Its functions are—

1. To float the corpuscles.

2. To permeate the walls of the capillaries, and to supply the tissues with nutrition.

3. To receive the waste products and carry them to the skin, kidneys, and lungs.

In anæmia there is either a deficiency of the number of red corpuscles or of the hæmoglobin contained in the corpuscles; or there may be deficiency of both. In the form of anæmia known as leuchæmia there is a large excess of the white corpuscles.

When blood escapes from the body it clots. First of all it sets and becomes semi-solid, then it separates into clot and serum. The serum is the thin yellow fluid which is squeezed out of the clot.

The fibrin which exists in the blood-plasma in a liquid form as long as the blood is circulating, is deposited, after the blood is removed from the body, in the form of fibres, which surround and enclose the corpuscles, and then contract until they are squeezed together in a compact mass which sinks to the bottom of the vessel while the serum floats to the top.

Various conditions affect coagulation.

Coagulation is hastened by—

1. Moderate warmth—100 to 120 degrees F.

2. Rest.—If the blood is kept in motion, shaken about in a closed vessel, it does not coagulate so readily as if it were at rest. In certain diseases the blood stagnates in the vessels from defective power of the heart, and coagulation may take place. This condition is called thrombosis.

3. Contact with roughened surface, as by stirring the blood with a bundle of twigs. In disease a roughening of the walls of the blood-vessels promotes thrombosis.

4. Addition of less than twice its bulk of water.

Conditions which prevent coagulation are—

1. Cold.

2. Contact with living tissue.

3. Imperfect aeration. In persons who die of asphyxia the blood does not coagulate.

The Circulation of the Blood is the process by which the blood is driven out of the heart into the arteries and arterial capillaries to the various parts of the body, and again returned to it by the venous capillaries and veins.

It may be divided into three parts—

1. The greater or systemic circulation, by which the blood is sent from the left side of the heart to the arteries which supply the whole body except the lungs, and is returned by the veins from the whole body except the lungs to the right side of the heart.

2. The lesser or pulmonary circulation is that by which the blood is sent from the right side of the heart to the lungs by the pulmonary artery, and returned from the lungs by the pulmonary veins to the left side of the heart.

3. The portal circulation is a part of the systemic circulation by which the blood sent to the stomach, pancreas, liver, intestines, and spleen is collected by the portal vein, and distributed through the substance of the liver to the inferior vena cava, which conveys it again to the heart.

The Heart is situated in the thorax, behind the lower two-thirds of the sternum. It is nearly surrounded by the two lungs. It is contained in a bag or sac, called the pericardial sac, and it is covered by a serous membrane, the pericardium, which is analogous to the peritoneum and pleura; the pericardium is reflected—turned back—on the inner surface of the pericardial sac, and the two adjacent surfaces are moistened by a serous fluid, which allows free movement without much friction.

The heart weighs about ten ounces, and a little less in a woman. It is the most important organ of the circulatory system, and resembles a pump in its action. It is made up of involuntary muscular fibres—that is, muscles which are not under the control of the will. The interior of the heart is divided by a partition into two main parts, the right and left sides, and each of these main parts is divided again into two parts, an auricle and a ventricle, so that in all there are four cavities in the heart—viz. the right and left auricles, and the right and left ventricles. The right auricle communicates with the right ventricle, and the left auricle with the left ventricle; but there is no direct communication between the right and left sides of the heart.

The **Right Auricle**—*i.e.* the upper cavity on the right side—receives two large veins, the inferior and superior venæ cavæ, which bring venous blood from the head, neck, arms, legs, and body. At its lower part it communicates with the lower right cavity, the right ventricle, by an orifice which is guarded by a valve made up of three flaps of membrane, whose edges are attached to the inside of the heart by fine tendinous threads. This is called—

The **Tricuspid Valve**.—When the blood flows from the right auricle to the right ventricle this valve is open. When the right ventricle contracts, the blood floats up the valve, and so shuts off the right auricle and prevents the blood from passing back from whence it came. There is another opening in the right ventricle,

The **Pulmonary Artery**, which has three valves of half-moon shape to guard the orifice. These are—

The **Pulmonary Valves.**—When the ventricle contracts the blood passes up into the pulmonary artery, and is driven on into the lungs; the blood then fills out these valves and their edges come together, thus entirely closing the cavity of the right ventricle, and preventing the blood passing back into the cavity whence it came.

On the left side of the heart, the left auricle receives the pulmonary veins, which bring from the lungs the blood that they have received from the right side through the pulmonary arteries. The left auricle opens below into the left ventricle, by an orifice guarded by a valve which consists of two flaps, and is similar in structure to the tricuspid valve—viz. the mitral valve.

The **Left Ventricle** is the most important and strongest part of the heart, and its muscle is the thickest. It has another opening into the aorta, and this orifice is also guarded by three half-moon shaped flaps, the aortic valves. When the blood passes from the left auricle to the left ventricle, the latter sends the blood on into the aorta, from which it is distributed to the various parts of the body.

The **Aorta** is the large, thick vessel which arises from the left ventricle. The first portion of it forms an arch, and from this arch the vessels are given off which go to the head and neck—viz. the carotid arteries; and the subclavian arteries, which supply the arms. The aorta then passes downwards through the thorax and abdomen, in its course giving off vessels which supply blood to the stomach, intestines, spleen, kidneys, etc. In the pelvis it divides into two large vessels the iliac arteries, which go to the two lower limbs. The main artery in the leg is the femoral, at the back of the knee it is called the popliteal, and divides into branches which supply the leg and the foot.

The continuation of the subclavian artery, as it passes through the axilla, is called the axillary artery, and in the arm the brachial. At the bend of the elbow it divides into the radial and ulnar, and in the palm these two arteries form an arch from which branches pass to the fingers.

The arteries divide and sub-divide in the muscles and other tissues until they become very small and are called arterial capillaries; they then unite with venous capillaries, which become larger and larger, until they become small veins, which open finally into one or other of the two large veins, the superior vena cava, which collects the blood from the head, neck, and arms, and the inferior vena cava, which receives the blood from the legs and body. These two veins open into the right auricle.

The deep veins usually accompany the arteries; they are more numerous, and larger and thinner than the arteries. When a vein is wounded the blood issues from it in a slow continuous stream, but when an artery is wounded the blood is forced out in a jerking manner. Many of the veins contain small pocket-shaped pouches or valves, which help the circulation. The arteries are made up of three coats, and aid the circulation by contracting and forcing the blood onward.

The **Portal Circulation** is a branch of the general circulation. Arteries are given off from the aorta which supply the stomach, intestines, pancreas, and spleen with blood, and the blood from these organs passes through the capillaries into a number of veins which join together to form the portal vein. This enters the liver and again breaks up into a number of capillaries, and is once more collected by small veins which finally form the hepatic vein, opening into the vena cava just before it enters the right auricle.

The **Lesser or Pulmonary Circulation.**—The pulmonary artery arises from the right ventricle and divides into two branches, one for each lung. Inside the lung it divides up into numerous smaller arteries, which divide further, until they finally become capillaries in the wall of the alveoli. From these capillaries the pulmonary veins are derived, which unite with each other until they form the pulmonary veins which convey the blood into the left auricle.

Movements of the Heart.—The heart beats usually from about sixty to eighty times in a minute in adults, and more frequently in children.

The two auricles contract together, and drive the blood into the ventricles, on the left side the blood which has come from the lungs, and on the right the blood which has come from the rest of the body.

The two ventricles then contract together, and the tricuspid and mitral valves close their respective orifices, and thus shut off the right and left auricles; the blood is then forced through the pulmonary and aortic orifices into the pulmonary artery on the right side, and the aorta on the left.

When the blood which was in the ventricles has been forced into these vessels, the semilunar valves close and shut off the cavities of the ventricles, and the arteries contract and force the blood still further on. It must be remembered that the blood cannot get from the right to the left side unless it passes through the lungs. Nor can the blood pass from the left side to the right unless it goes round by the general or portal circulation.

Course of the Blood, starting from the left auricle. The blood in the left auricle is arterial—*i.e.* fully laden with oxygen, which has been derived from the lungs, having passed through the pulmonary veins into the left auricle.

The left auricle contracts, and drives the blood into the left ventricle; this contracts, the mitral valve closes and shuts off the cavity of the left auricle, and the blood is driven into the aorta. The aortic valves fly back and prevent the blood from flowing back into the left ventricle. Some of the blood then passes into the subclavian and carotid vessels, and thus gets to the head, neck, and arms; the rest of it passes downwards, and goes to the intestines and other abdominal viscera, and to the legs and the rest of the body. It passes along into the smaller arteries and then into the capillaries, where some of the oxygen is taken away to maintain the body heat, etc., and the carbonic acid, nitrogen, and other waste products are given up and carried along into the small veins, and then into the larger veins, until the blood reaches the inferior and superior venæ cavæ. Some of the blood, however, has not taken this course: it has passed to the stomach and intestines, and has taken up the products of digestion, peptones, sugar, water, etc., and has then passed into

the veins which join together to form the portal vein, which passes to the liver and gradually divides up into smaller branches; from these smaller veins it gets to the capillaries, and then into the veins which join together to form the hepatic vein which enters the inferior vena cava. So the blood that has passed through the portal circulation enters the inferior vena cava with the blood which has come from the lower part of the body, and passes into the right auricle, as also does the blood from the head and neck, which has collected into the superior vena cava. The right auricle contracts and drives it into the right ventricle. This contracts, and the tricuspid valves close the cavity of the right auricle and the blood passes into the pulmonary artery. The pulmonary valves contract and shut off the cavity of the right ventricle, and the blood reaches the lungs. This blood, of course, is venous, and is laden with carbonic acid. In the lungs the carbonic acid is given up and oxygen is absorbed, and the blood, which is now arterial, passes into the pulmonary veins and enters the left auricle.

The **Pulse** is the movement of alternating expansion and contraction of the arteries at each beat of the heart. The character of the pulse is an important indication of the condition of the action of the heart.

The artery usually felt is the radial at the wrist. Sometimes the temporal artery is felt. It should be remembered that the radial artery does not always run in its usual position. It sometimes turns over the radius to the back of the wrist two or three inches above the wrist joint. The patient's hand should be held in an unconstrained position, and the radial artery felt with the two first fingers of the right hand.

The chief points about the pulse that the nurse should notice are—

1. The **rate.**—This is normally from sixty to eighty. It is slow in cases of aortic stenosis and fatty heart, in collapse, meningitis and cerebral tumours, and jaundice. In some cases the pulse is slow because all the heart beats are not transmitted to the wrist.

The rate is increased in fevers, exhaustion, and in most cases of heart disease.

2. The **regularity**.—The pulse is sometimes irregular in disease —*i.e.* the intervals between the successive beats are not of uniform length. This occurs in mitral disease, cardiac dilatation, and meningitis. When an occasional beat is left out the pulse is called intermittent.

3. The **volume**.—This varies much in various forms of disease, from the full, large pulse of some fevers to the small, scarcely perceptible movement that indicates a condition of great gravity.

CHAPTER XXVII

SYMPTOMS OF HEART DISEASE

1. **Dropsy** is caused in heart disease by a difficulty in the return of the blood to the heart. As a result of this the veins and capillaries become over-full of blood, and the fluid part of the blood then escapes into the connective tissue, and is also poured out into the serous cavities, causing effusion in the peritoneal, pericardial, or pleural cavities. The legs swell and the skin becomes shiny, and they pit on pressure. The abdomen swells, in consequence of the fluid in the peritoneum; this condition is known as ascites. The fluid in the chest presses on the lungs and dyspnœa results. The swelling first appears in the feet, ankles, and legs, and may then spread upwards and affect the abdomen and lower parts of the back; the arms may also swell.

In cases of extreme dropsy great care must be taken to avoid bed sores. Such patients become very helpless. Sometimes the œdema goes down after rest in bed. The urine in these cases is scanty, and should be saved and measured, for the treatment aims at getting rid of the fluid parts of the blood by diuretics and purgatives, and the physician will expect to know exactly how his remedies are acting.

In some cases where there is great swelling of the legs which does not disappear with rest, the legs are pricked, or Southey's tubes are inserted to drain off the fluid. Great care must be taken to observe cleanliness, as erysipelas occasionally occurs after acupuncture. The legs should be wrapped in absorbent cotton-wool to soak up the fluid which exudes from the punctures.

1. **Dyspnœa, Orthopnœa.** — Difficulty of breathing is a very important symptom of heart disease. It is brought on by any extra excitement, and in advanced cases it is almost constant. The patient often finds ease only when propped up in bed by pillows. The nurse must not allow patients with this symptom

to exert themselves in any way by trying to lift themselves, as exertion increases the dyspnœa, but they must obtain help to lift them into an upright position. Three or four pillows or more may be necessary to gain this comfortable position for them. Some cases suffer especially at night, and cannot lie with any comfort in bed, even when thus propped up. They must be lifted out of bed, carefully wrapped up with blankets, and made comfortable in a high-backed arm-chair before the fire. The nurse should also be careful not to hurry them, either in moving or washing or feeding them.

3. **Severe Pain.**—Angina pectoris is not an uncommon symptom of heart disease in adults. It may be brought on by exertion, such as going uphill, or by undue excitement or exposure to cold.

The patient is suddenly seized with acute pain at the lower end of the sternum, the pain goes then to the left side and back and left shoulder and shoots down the left arm; there is a feeling of tightening in the chest, of impending death and suffocation, and afterwards faintness, collapse, and sweating.

Treatment.—Nitrite of amyl, which is made up in small capsules holding about four minims. One is crushed in a pocket handkerchief or in a bit of lint, and the vapour is inhaled. A morphine injection is often given, and if the pain is very intense and unyielding it may be necessary to give an inhalation of chloroform. In such a case the physician should be summoned, as the patient may die during the attack. The nurse must as far as possible avoid any exertion or excitement for her patient, and must see that the diet is carefully regulated, avoiding any excess in eating or drinking.

There are many varieties of heart disease.

The pericardium may be inflamed—Pericarditis.

The muscle may be diseased—Myocarditis.

The valves may be diseased—Endocarditis.

The cavities may be dilated—Dilatation.

Pericarditis. — Inflammation of the pericardium is most commonly caused by acute rheumatism, Bright's disease, pneumonia, or pyæmia.

The symptoms are pain and distress over the cardiac area, often intense and agonising, tenderness on pressure, shortness of breath, short, hacking cough, a fast pulse, which afterwards becomes irregular, a high temperature, which may be raised to 105 or 106 degrees, loss of appetite, thirst, a dry tongue, and scanty urine. The face becomes drawn and pinched, and delirium and coma may follow.

Treatment.—Complete rest in bed. No exertion of any kind. The nurse must get help to shift the patient gently; she must not allow talking or excitement, and all worry must be kept from him as far as possible. The diet must be fluid, chiefly milk. If the pericarditis follows rheumatism, beef-tea is not given. Leeches, poultices, or blisters, are applied for the relief of pain. Sometimes an ice poultice relieves the pain better than a hot one. In rheumatic pericarditis, salicylate of soda is given, and digitalis, brandy, and ammonia.

Valvular Disease.—The valves become too narrow, and so obstruct the flow of blood, or they become incompetent—*i.e.* they do not entirely shut off the cavity from which the blood comes, and allow some of it to regurgitate or flow back. For example, in acute rheumatism the mitral valve often becomes inflamed (endocarditis), fibrous tissue forms around it, and after a time contracts and narrows the mitral orifice and so obstructs the flow of blood from the left auricle into the left ventricle—this is mitral stenosis or obstruction.

By a similar process the flaps may not be able to meet, and do not shut off the cavity of the left auricle during the systole, so that when the ventricle contracts, instead of all the blood passing upward into the aorta, some of it flows backwards into the left auricle whence it came. This is mitral regurgitation.

Aortic stenosis and regurgitation are caused in the same manner.

Mitral Disease is the most common form of heart disease.

Symptoms.—Pain and cardiac distress, palpitation, dyspnœa, swelling of the feet. In later stages there is congestion of the lungs—*i.e.* they get over-full of blood, causing hæmoptysis; orthopnœa, lividity of the lips, cheeks, ears, and extremities, ascites, scanty

urine, and rapid, irregular pulse. Sudden death is uncommon in mitral disease.

Treatment.—The patient must abstain from violent exercise and over-exertion. He must rest, and be kept in bed altogether if he is really bad. If there is orthopnœa he must be comfortably propped up with pillows. He must avoid sudden movement. The circulation will be relieved by free action of the bowels, kidney, and skin. If there is cyanosis, venesection may be necessary.

The drugs used for mitral cases are digitalis, ammonia, strychnine, etc.

Aortic disease affects males more than females.

Symptoms.—Anæmia and dyspnœa. The carotids and other arteries can be seen pulsating. There is cough, with an expectoration of mucus. The feet and other parts of the body swell as the disease progresses. This form of heart disease causes sudden death.

Treatment.—Rest, as in all other kinds of heart disease; no hurry nor worry nor excitement should be allowed, nor any extra exertion. The meals should be light and regular. When there is faintness, the patient should lie down with his head low.

The drugs used for aortic cases are chiefly iron and strychnine.

Ulcerative or Infective endocarditis.—In this disease the tissues of the inflamed valves break down, so that ulcerations take place, and as a result of this fibrin is deposited upon the roughened surfaces, and large masses or vegetations are formed. Little pieces may break off from these vegetations and become loose, and then they are carried off in the blood stream until they finally reach a vessel through which they cannot pass, so that this vessel becomes blocked. These little masses of vegetation are called emboli. They are most commonly impacted in—

1. The spleen, which gives rise to pain under the ribs on the left side.
2. The kidney, causing pain in the loins and hæmaturia.
3. The brain, causing paralysis of one side of the body and loss of consciousness.
4. Some of the arteries of the limbs, causing painful swellings,

which are treated by rest and hot fomentations. This condition is known as thrombosis.

Patients who are suffering from this form of heart disease are anæmic, and are subject to rigors, and a temperature of 102 to 105 degrees. The pulse is quick, there is profuse sweating, and prostration and increasing weakness. The prognosis is very bad.

Fatty degeneration—*i.e.* fatty changes in the muscle of the heart. It may accompany general obesity, or phthisis, cancer, or other wasting diseases, and it sometimes follows phosphorus poisoning and acute fevers.

The *Symptoms* are anæmia, syncope (fainting), dyspnœa, slight swelling of the feet, and a slow and feeble pulse.

Treatment.—Undue exertion and mental excitement is to be avoided. Tonics are given, quinine, iron, strychnine.

Congenital heart disease arises from defective development of the heart, or may be due to endocarditis.

The *symptoms* are extreme lividity of cheeks, lips, ears, nose, fingers, and toes, which is due to imperfect aeration of the blood; coarse nose and lips; clubbed fingers. The patient is out of breath on the slightest exertion, and is particularly susceptible to cold. Towards the end there is œdema of the legs and ascites.

Children who suffer from this disease must be kept very warm; they must wear flannel and live in warm rooms, and avoid exposure to cold. They must not be excited, and as far as possible must be kept from coughing and from falling into passions. As they grow older they must lead a quiet life, and be provided with good food, and tonics if necessary.

Aneurism of the Aorta.—Aneurism is the dilatation of an artery for more or less of its course. It is caused by anything which weakens the vessel at one point, such as muscular strain, or the diseased condition of the vessels known as atheroma. The result is pressure on the surrounding parts; pressure on the trachea causes dyspnœa, pressure on the arteries causes the pulses to be unequal, and pressure on the bone gives great pain of a gnawing character. In time the aneurism will even eat away the bone on which it presses.

The aneurism could be cured if the bloodwere made to clot in it.

Death from aortic aneurism may take place from rupture externally or in the chest.

Symptoms of Internal Hæmorrhage.—The pulse becomes very feeble, and the surface of the body feels cold and deathlike. The features are sunken, and the eyes retracted. There is great restlessness, fainting, and deathly pallor. The respiration becomes shorter.

Symptoms of Aneurism.—Pain in the chest, pulsating tumour, throbbing vessels in the neck, irregular pulse, dyspnœa, cough, etc.

Treatment.—The objects of treatment are to favour coagulation of blood in the sac, and to prevent rupture and enlargement. Absolute rest in bed is the chief means used to attain this, the patient not being allowed to stand nor even to sit up.

There is a special diet which is sometimes given to patients whose food it is desirable to restrict, consisting of three ounces of meat, seven ounces of other solids, and eight ounces of fluids.

Sedatives, such as opium and morphine, are given to ease the pain and to prevent restlessness; and iodide of potassium is also given.

CHAPTER XXVIII

THE KIDNEYS

THE urinary organs consist of two kidneys, two ureters, and the bladder.

The kidneys excrete the urine, the ureters convey the urine to the bladder, where it is stored up until it is passed.

The kidneys are deeply situated at the back of the abdominal cavity, behind the peritoneum, one on each side of the spine. They are about 4 inches long, $2\frac{1}{2}$ inches broad, and $1\frac{1}{2}$ inches deep. Each weighs about $4\frac{1}{2}$ ounces.

The kidney is a glandular organ, and is covered with a fibrous capsule. The surface is smooth. On cutting it through it is seen to be made up of two portions, the cortical and the pyramidal. These portions consist of numberless little tubules which end at one extremity in the cortex as little saccules which are well supplied with blood-vessels, and open at the other end at the tips of the pyramids into the upper part of the ureter, which is called the pelvis of the kidney.

The kidney is supplied with blood by the renal arteries, which come off from the aorta, and divide up in the kidneys into smaller and smaller arteries, until finally one small artery, the afferent artery, goes to each Malpighian tuft, in which it breaks up into the small capillaries which collect together again until they form the efferent vein. This vein breaks up again into capillaries which unite once more till they form the renal vein, which carries back the blood to the inferior vena cava.

The ureters are the excretory ducts of each kidney. They are tubes about the size of goose-quills, 12 to 16 inches long, which are continuous with the pelvis of the kidney above, and below enter the bladder.

The **Bladder** is the receptacle for the temporary lodgment of urine. It is an oval shaped bag, about 5 inches long and three

inches broad, and capable of holding a pint of fluid. It is made up of three coats, an inner or mucous coat, a muscular, and the outer coat, which is fibrous and elastic. Its neck is guarded by a circular muscle, which contracts when the urine is retained, and relaxes when it passes.

The **function** of the kidneys is to get rid of certain waste products which are contained in the blood carried to the kidneys by the renal artery.

Normal urine is a clear, pale, amber-coloured fluid of acid re-action. Its specific gravity is 1015 to 1025. It consists of water, holding certain substances in solution. About 60 ounces are passed daily.

Composition—

Water	967
Urea	14·230
Other nitrogenous bodies	16·635
Salts—sulphates, chlorides, etc.	2·135
	1000

In the kidney the urine is formed by two distinct processes, filtration and secretion.

By the process of filtration most of the fluid and certain of the organic salts are eliminated. It is dependent upon the blood pressure, and is accomplished by the glomeruli (Malpighian tufts).

By the process of secretion the urea and other nitrogenous products are eliminated, and this is done by means of the cells of the tubules.

The urea is derived from the splitting up of the elements of nitrogenous food, and by the nitrogenous metabolism of the tissues.

As each portion of urine is secreted it passes onwards along the tubules into the pelvis of the kidney, then through the ureter into the bladder, where it remains until the walls of the bladder contract and drive it onwards through the ureter.

The quantity, specific gravity, reaction, colour, etc., are liable to vary in health as well as in disease.

Quantity.—It is of great importance to the physician in many

cases that he should know the exact amount of urine which is being passed in the twenty-four hours. It is especially important in patients who are suffering from any kind of kidney disease, some forms of heart disease, etc. The patient must be directed to pass the urine separately, the whole of the urine for twenty-four hours must be collected, and when a specimen is taken for the physician's examination, it must be well stirred up on account of the deposits.

In some diseases the quantity of urine is increased. In diabetes mellitus from 5 to 15 pints are sometimes passed, and in diabetes insipidus a very large amount, even as much as 30 or 40 pints. There is also an increase in chronic Bright's disease, and in hysteria. Drinking large quantities of fluid in cold weather tends to increase the amount, while hot weather diminishes it, and there is a lessened amount secreted by the kidneys if large amounts of fluid are being lost in any other way, as by profuse sweating, diarrhœa, or vomiting.

The **Specific Gravity** is sometimes altered.

In diabetes mellitus it is increased to 1030-1060, and it is increased in concentrated urine—*i.e.* urine which contains an undue proportion of solids.

It is decreased in diabetes insipidus, in chronic Bright's disease, and in pale urines.

The **Colour** may vary from the normal light amber.

It is very pale in diabetes and chronic Bright's disease. Concentrated urine has a dark colour. Blood in the urine is called hæmaturia, and may be a bright red colour, or any other shade of reddish brown. Bile gives it a mahogany brown or olive green tint. It is altered by certain drugs—*e.g.* carboluria, or poisoning with carbolic acid, blackens the urine, and santonin taken internally changes it to orange. Pus in the urine and chyluria give a milky deposit at the bottom.

Deposits.—If there is a thick deposit of a fawn colour or pink or brick red in acid urine, it consists of urates. This disappears on heating. It is seen in concentrated urine.

Pus appears as a thick yellow deposit, in cystitis, tuberculous kidney, and calculus.

Blood may be in clots or in brownish deposits like the sediment of beef-tea; it is found in cases of acute Bright's disease, calculus, etc. The test commonly used for blood is ozonic ether and tincture of guaiacum.

Uric acid forms a reddish deposit like cayenne pepper.

Mucus appears in light flocculent clouds.

Phosphates leave a white deposit in alkaline urine, which disappears on the addition of acid.

Albumen is found in Bright's disease. Heat and nitric acid are the commonly used tests.

Sugar is tested for by Fehling's solution.

Bile (in jaundice) by nitric acid.

Diseases of the Kidney.—The chief of these are acute and chronic Bright's disease, diabetes mellitus, calculus, tubercle, carcinoma, etc.

Acute Bright's Disease = acute nephritis.

This is caused by exposure to cold and wet, especially if the individual is under the influence of alcohol; it follows scarlet fever and measles during convalescence, and it occurs in diphtheria and pregnancy.

The symptoms are scanty urine, frequent micturition, pain in the loins, blood and albumen in the urine, and dropsy. There is œdema of the legs, body, eyelids, and face, ascites, and pleuritic effusion. In bad cases the urine may be altogether suppressed, convulsions may occur, and end in coma. Extreme dropsy may lead to gangrene, sloughing, and erysipelas of the lower extremities.

Treatment.—The patient must be kept in bed in a warm room (65 degrees), clothed in flannel and lying between blankets. The diet is milk and soda-water or barley-water. Eggs and meat are not allowed. In a case of moderate severity, the patient may soon be given farinaceous food—gruel, arrowroot, etc., and as he gets better, fish, and lastly, meat. Poultices and dry cupping relieve the lumbar pain. The medicines given are purgatives and diaphoretics, with the object of getting rid of some of the fluid. Imperial drink is taken to flush out the tubules. It is made of one drachm of cream of tartar to a pint of boiling water, and is flavoured with lemon and saccharin.

If there is much dropsy a vapour bath may be ordered. The bed-clothes are raised by means of a cradle and fitted close round the patient's neck, and to the sides and end of the bed. A long tube from a kettle of boiling water projects into the space formed by the cradle, and the steam promotes free perspiration.

For a hot air bath a spirit lamp is burned under a funnel connected with a tube whose end projects into the cradle.

In cases of extreme dropsy the fluid is removed by pricking the legs, or by inserting Southey's tubes—small hollow tubes which drain off the fluid.

If there are uræmic convulsions, venesection may be performed, or chloroform given, or a hypodermic injection of pilocarpine to promote sweating.

When the patient is recovering, iron is given him on account of his anæmia.

Chronic nephritis is most frequent between the ages of forty and sixty; it is often due to gout, lead-poisoning, or alcoholism.

Symptoms.—It comes on slowly, with headache, nausea and vomiting, dyspnœa, anæmia, loss of appetite, and general weakness. A large amount of urine is passed, by night as well as day. Some of the results of chronic nephritis are cerebral hæmorrhage, causing apoplexy; and pleurisy, pericarditis, peritonitis, and dilatation of the heart.

Treatment.—The patient should be warmly clad, and should live if possible in a warm climate. He should take a moderate amount of exercise. His diet should include very little meat or alcohol, only a little claret, sherry, or well diluted whisky being allowed. He must avoid any exposure to cold, or working in lead, or whatever has caused the disease. The drugs given are purgative and diaphoretic, and the headache is sometimes relieved by nitro-glycerin.

Renal calculus = stone in the kidney. The stone is formed of uric acid, oxalate of lime, or other substances. It causes lumbar pain, hæmaturia, and pyuria. If it gets into the pelvis of the kidney it produces **renal colic**, in consequence of the spasmodic contraction of the ureters. The pain is sudden and excruciating, and shoots into the groin and down the leg. The patient may

writhe about on the floor, and sweat profusely. He becomes pale and collapsed, and often has a rigor or vomits. Sometimes the urine is entirely suppressed, or the obstruction may give rise to hydronephrosis.

Treatment.—Distilled water to drink, alkaline medicines, and turpentine given in capsules. Exercise is likely to be a preventive. The remedies used when an attack of pain comes on are a hot bath, rest in bed, morphine, and local soothing applications, such as belladonna. An operation is generally necessary.

Moveable Kidney.—The kidney is sometimes displaced from its position, especially in women, under conditions which first stretch and then relax the tissues. These conditions may be pregnancy, emaciation, or tight-lacing. The right kidney is the one generally affected.

Symptoms.—The patient feels a weight or dragging pain in the loins, which is aggravated by exertion. There are attacks of pain and tenderness, with scanty, high-coloured urine and nausea and vomiting.

If rest in a recumbent position does not give relief, a belt may be worn that is fitted with a pad to press the kidney back into its proper position. Sometimes recourse is had to an operation.

Diabetes Mellitus.—This may arise as a hereditary disease, and it has been known to follow mental excitement, anxiety, etc. Often there is no apparent cause.

Symptoms.—These often develop slowly, the patient notices that he drinks more fluid and passes more urine, and that he is growing weak and losing flesh. The thirst increases, the tongue is red and beefy-looking, there is a sweet taste in the mouth, the teeth decay and fall out, and the skin is dry and harsh. Diabetes often ends in coma and death.

It has many complications. Persons suffering from diabetes are especially liable to pruritus, eczema, boils and carbuncles, gangrene of the extremities, phthisis, pneumonia, cataract, etc.

The treatment is to remove from the diet all food containing sugar or starch.

The patient may not eat bread, potatoes, sugar, fruit, pastry, farinaceous foods, rice, arrowroot, sago, tapioca, macaroni,

vermicelli, semolina, carrots, parsnips, turnips, peas, beans, Brussels sprouts, cauliflower, etc.

He may eat butcher's meat (except liver), ham, bacon, tongue, poultry, game, fish, soup and broth, not thickened, greens, spinach, watercress, cucumber, endive, radishes, celery, vinegar, oil, pickles, eggs, cream, butter, savoury custard, gluten bread, almond biscuits, and bran biscuits.

He may drink tea and coffee with very little milk, cocoa made from the nibs, Liebig, soda and potash water, Seltzer and Apollinaris, dry sherry, Sauterne, Burgundy, Chablis, Hock, brandy, and old whisky.

The drugs generally given in diabetes are opium, codeine, and morphine.

CHAPTER XXIX

THE SKIN

THE skin, the external covering of the body, is divided into

1. The cutis vera (true skin), made up of fibrous tissue, blood-vessels, and nerves.

2. The epidermis or cuticle, consisting of little epithelial cells in several layers, of which the upper layers of scales are continually being shed, and the lower ones coming to the surface.

The cutis vera contains sweat glands and their tubes, hair follicles or sacs, and the sebaceous glands, which open into the hair follicles and secrete a fatty substance.

The epidermis in its deep layers contains the colouring matter or pigment of the skin. There are minute elevations at the lowest layer of epidermis, called papillæ.

Functions of the Skin

1. Protection.

2. Organ of touch.—The papillæ contain the terminations of small nerves. Nerves are supplied abundantly all over the skin, but the sensitive parts of the body contain most, the finger-tips, the tip of the tongue, and the lips.

3. Secretion of oily matter, which gives a certain amount of greasiness to the skin and hair.

4. Excretion of sweat.—This consists of water, with a very small proportion, 5 parts in 1000, of solid material, acids, salts, and fat.

5. Absorption.—This property of the skin is made useful in giving drugs, such as mercury, which are rubbed in or applied in vapour. The blood-vessels absorb the drug. Mercury liniment is often rubbed into the abdomen for tuberculous peritonitis.

6. Regulation of the body temperature.—This takes place by the greater or less amount of blood which is supplied to the skin, and excretes more or less perspiration, which cools the body by its evaporation. In cold weather the vessels of the skin contract, and the blood is driven in; while in hot weather the opposite takes place, the vessels dilate, and are filled with blood, and sweat is poured out.

Changes which occur in the Skin

1. Congestion—undue redness.
2. Papules—pimples, solid elevations not larger than a pea.
3. Vesicles—similar elevations containing clear fluid.
4. Blebs—elevations larger than a pea, containing clear fluid.
5. Pustules—elevations not solid, containing pus.
6. Scabs or crusts—formed by the drying of the contents of vesicles, blebs, and pustules.
7. Dry flakes of the superficial cells of epidermis.
8. Scars or cicatrices—the result of the healing process after an injury, which is sufficient to destroy the papillæ or other part of the true skin.
9. Raw surfaces—where the superficial layers of the epidermis are removed.
10. Hæmorrhages—red or purple patches.
11. Stains—changes in colour, as after a bruise.

Diseases of the Skin

Eczema.—This is a superficial inflammation of the skin, to which some people are very liable, without any apparent reason. But there are many conditions which do produce it. Sweat glands which act too freely may cause eczema, as well as certain drugs, ointments, and irritating soaps. Exposure to the sun is another cause, and grocers are subject to it in the hands, from handling sugar. Discharges from the nose and ear, varicose veins, and constitutional diseases, such as gout and diabetes, produce it.

The attack begins with itching and smarting. The skin be-

comes red, and small vesicles are seen on it, which rupture and discharge fluid. These vesicles run together until a large raw surface is produced. Sometimes large scabs are formed from the discharge, which, as it becomes dry, will stiffen the linen worn. Eczema leaves no scar, but sometimes the skin is thickened after it. The commonest places for it to occur are the face, neck, ears, back of the ears, flexure of the elbows and knees, and the inner side of the thighs.

The *treatment* is to protect the part affected from irritation. Woollen garments must not be worn next the skin, and the patient must not be exposed to great extremes of heat or cold. In the case of children, the hands should be tied up in cotton-wool to avoid scratching. The less the patient is washed, the better it is for him. He must not use soap at all, and if water is necessary, it should be used warm, and thoroughly softened with oatmeal, and the skin must be carefully and thoroughly dried. If the crusts are very thick, they must be removed before any application can be effectual. Poultices, or lint wrung out of olive oil, will clear the skin, or the scabs may be removed by a thin piece of cardboard passed between the scab and the skin. The scalp can be cleaned with the white of egg, but sometimes all the hair has to be cut off. The patient should live in a well-ventilated room. Ointments and lotions are applied on lint and bandaged on. Unguentum metallorum, a mixture of lead, zinc, and mercury, is often used.

Internal treatment. — The bowels are kept rather loose, and tonics are given. If the itching prevents sleep, draughts are given, and children also need sleeping-draughts to keep them from scratching. Arsenic is often used in eczema. The diet should be light, and stimulants and salt foods are to be avoided.

Psoriasis is a hereditary disease, and has no direct cause. It begins with raised red patches, covered with silvery scales, and generally affects the knees and elbows. In bad cases it may extend over the whole body, and it occasionally, but rarely, covers the scalp. Arsenic and other medicines are given internally, and ointments to the skin, which should be well rubbed in. Tar and

chrysarobin ointments are used, both of which have the disadvantage of staining linen.

Herpes—Shingles.—This is an eruption of vesicles, arranged in a group which corresponds to the distribution of a nerve—*i.e.* it occurs on the part of the skin which is supplied by one particular nerve and its branches. It may spread from the spine to the sternum. There is a tingling numbness, and sometimes a good deal of pain, before the eruption comes out. The vesicles become scabs, and the scabs leave little red patches, and sometimes there is pain left in the course of the nerve after the eruption has disappeared. Zinc ointment or zinc and starch powder is used to protect the vesicles, and if there is much pain, a little morphine is added to the powder.

Ringworm, or tinea tonsurans, is due to a vegetable parasite or fungus. It is very infectious, spreading by contact. It begins as a round patch covered with thin hair; in a short time the patch is covered with bran-like scales, and the hair is destroyed, only stumps and bits of broken and twisted hairs being left. Sometimes there is a little inflammation and swelling, and some points discharge a little pus. The disease is not common in adults; but if one child in a household is attacked by it, all the other children will be infected, unless the utmost care is taken. The child must sleep alone, and must use different comb and brush and towels. The head must be shaved, and should be kept shaved as long as the disease remains. A little fringe of hair may be left in front for the sake of appearance. Carbolic or mercurial ointment may be rubbed in, and protected by a linen or silk cap. The cap should be clean every day, or, at least, lined daily with clean paper.

Favus is a rare disease in England, though not unusual in Scotland. It is a vegetable parasite producing bright yellow discs, with a mousey odour. It is very intractable.

Scabies—itch—is caused by an animal parasite, which bores its way under the skin, and causes intense itching and scratching. The disease itself causes papules, vesicles, etc., and the scratching produces eczema in addition. It is generally to be seen on the skin between the fingers, and may affect any part of the

body, but is rarely seen on the face. The treatment consists of warm baths, followed by free inunction of sulphur ointment, which kills the parasite. Sometimes this free use of sulphur produces eczema. The clothes that have been worn by a patient with scabies are better burnt, but if this is impossible they must be thoroughly disinfected by baking.

Pediculi capitis—lice in the head—cause itching, crusts, and impetigo. The crusts must be removed by poulticing, and the impetigo treated by ointments of various sorts—mercury, tar, and carbolic ointments are all useful.

The eggs, or nits, adhere tightly to the hairs, and are difficult to remove. The best treatment is to cut off all the hair quite close to the head ; but if this is not possible, a small-tooth comb must be used daily till the head has been clean for a week or more.

CHAPTER XXX

THE NERVOUS SYSTEM

THE nervous system consists of the brain, spinal cord, and nerves. The cranial cavity contains the brain, the vertebral cavity contains the spinal cord, and the nerves pass out from each of these to every part of the body.

The brain is covered with three membranes—

1. The pia mater, the innermost membrane, contains many vessels which supply the brain. It is closely attached to the brain, and passes into all its little fissures.

2. The arachnoid, a serous membrane, secretes a clear fluid, known as the cerebro-spinal fluid, which fills up the space between the brain and spinal cord and the bones which contain them. The fluid is mostly at the base of the brain. It acts like a water-bed in preventing injury to the brain from a jump, blow, etc., which would otherwise jar the brain against the bone. Uniform pressure is maintained in the brain by this fluid, which ascends and descends from the spinal cord according to the amount of blood in the brain. The escape of the cerebro-spinal fluid through the ear is one of the signs of fractured base.

3. The dura mater, the outermost membrane, lines the inside of the skull. It contains many large vessels connected with the brain and skull, and with the scalp by small holes in the skull. It is thick, tough, and fibrous.

Similar membranes cover the spinal cord, which is protected as carefully as the brain.

Inflammation of these membranes is called meningitis.

The brain consists of two parts, the cerebrum and the cerebellum.

1. The cerebrum, or upper part of the brain, is divided by a large fissure into two hemispheres. These two parts are joined in the centre by fibres.

2. The cerebellum, or lesser brain, occupies the lower part of the skull.

They are both composed of two sorts of tissues, the grey and the white matter, which make up the nerves and nerve-cells; there are also tissues which hold them together. The outer part is the grey matter, the inner is white. There are certain cavities in the brain, known as ventricles.

3. The pons varolii is made up chiefly of white matter and nerve fibres. It connects the cerebrum and cerebellum with the medulla, which is continuous with the spinal cord.

From the under surface of the brain are given off twelve pairs of nerves, which supply various parts of the body, one pair going to the eyes, another to the nose, others to the ears, tongue, muscles of the face, lungs and heart, pharynx and larynx, etc.

The spinal cord is formed, like the brain, of grey and white matter, but the white matter is outside and the grey inside.

The nerve fibres which compose the brain cross at the pons, before they reach the medulla and the spinal cord. Hence an injury to the right side of the brain gives symptoms of paralysis, etc., on the left side of the body, and *vice versâ.*

The functions of the brain and spinal cord are to control the motions of the body, the blood-supply, the secretions, etc. The brain is the seat of the intelligence, senses, and emotions. Certain parts of the brain have certain functions; one part has to do with memory, another with movements of different parts of the body, and so on. The name given to the various parts of the brain which control certain actions is "motor areas."

The cerebellum is of less importance than the cerebrum. It co-ordinates the movements—that is, it controls and balances them by regulating the action of the muscles. A man with disease of the cerebellum, such as tumour, will walk with a staggering gait.

The pons is made up of the fibres from the two hemispheres. Injury to the pons causes loss of power in the face, limbs, etc.

The medulla controls the heart and lungs, and is therefore a very important part of the brain, and injuries to it are generally fatal.

Each of the nerves passing out of the spinal cord is composed of delicate nerve fibres, which spring from roots, one bundle of fibres in front, and the other at the back of the spinal cord, known as anterior and posterior nerve roots. The posterior nerves are sensory, and the anterior are motor nerves. There are thirty-one pairs of nerves in all.

The brain moves the muscles by means of the anterior or motor nerves, and sensation is carried *to* the brain by the posterior or sensory. Destruction of the spinal cord—*i.e.* of the communication between the nerve and the brain—prevents any voluntary movement in the body below the injured part and any sensation in it. If the anterior nerve root is destroyed, the patient may will a certain action, but the impulse cannot pass the injury, and no movement follows. If the posterior root is injured, there can be no sensation in the part of the body controlled by that nerve. The nerve is composed of the two sorts of fibres, so if the nerve is destroyed or cut, power and sensation are equally lost. The muscles also waste, and because the skin and tissues are not properly nourished, bed-sores may appear. Certain movements do not require the control of the brain; these are called reflex movements.

Certain sensory impulses travel up the nerve to the cord and produce other impulses, which travel down the nerve again by the motor fibres—*i.e.* the reflex produces motion. But a great deal is always going on in our bodies that our brains have no consciousness of. Thus, digestion, circulation, etc., are always going on without our consciousness; and will even go on when the spinal cord is destroyed, because they are not controlled by the nerves of the brain and the spinal cord.

Hæmorrhage into the brain destroys the fibres which pass to the nerves, and communication with the muscles is stopped, and paralysis ensues.

Diseases of the Brain and Nervous System

Meningitis, inflammation of the membranes of the brain. This may be due to injury, or to tuberculous growth in the membrane itself. The inflammation causes an increase of fluid in the brain,

and pain, and all the usual signs of inflammation. Cases of tuberculous meningitis are most common between the ages of 5 and 18. They begin with headache and general irritability, loss of appetite, and sleeplessness. The temperature becomes high, but the pulse is often very slow and irregular. The head is thrown back, and kept rigidly in this position—the child's whole body moves when his head is lifted. There is a peculiar cry, a sharp, shrill scream, which is common in meningitis. There are often convulsions and delirium. The disease is almost always fatal, and lasts about three weeks, the patient gradually passing into coma, from which he does not rouse. When he is in this comatose condition, he lies with his eyes open, generally squinting, and with no movement of the eyelids. If this continues long, the eyes will inflame and slough, so that the nurse should keep them closed by a bandage.

Treatment.—Ice is applied to the head, to relieve the intense headache, and leeches to the back of the ears, and blisters are sometimes used. Purgatives are given to relieve the constipation which is generally present; and the food is fluid, chiefly milk and beef-tea. The room should be kept dark and quiet, as light and noise increase the pain in the head.

Apoplexy.—When a vessel in the brain gives way, the blood pouring from the opening tears up the brain substance, causing injuries which often result in death. This is known as cerebral hæmorrhage.

Apoplexy occurs most often in those of advanced years, and of the male sex, and in those suffering from Bright's disease, chronic alcoholism, gout, lead poisoning, and atheroma, in which latter disease an embolus may be carried from the heart to the brain, which blocks one of its vessels. When part of the brain substance is destroyed, those fibres are generally affected which pass to the arm, leg, or face, on the opposite side of the body.

The onset is generally sudden, but it is sometimes preceded by headache and twitching of some limb. When the hæmorrhage takes place, the patient suddenly falls down unconscious, with a flushed face, and stertorous breathing. His eyes are turned towards the side of the head which is injured. When the tongue

is put out, it inclines towards the paralysed side. Consciousness may return after a time, but it is seen that one side is paralysed. When the hæmorrhage is in the left side of the brain, the speech may be lost. When the hæmorrhage is a large one, it causes death, and a small hæmorrhage causes hemiplegia and possibly loss of speech.

Treatment.—Get the patient to bed; put an icebag to the head to try to stop the internal bleeding. He may be given calomel, that the purging may lower the tension in the blood-vessels. He must be kept on low diet, milk only at first, and no stimulants. During recovery electricity is often used; one of the wires is put on a sponge at the back of the head, the other wire, covered with a sponge wetted in salt and water, is used to stroke the muscles. Massage is also applied to the affected limbs, and the patient is encouraged to use them.

The patient is very liable to a second attack; he must avoid any exertion which would be a strain on the blood-vessels, and he must be careful of his diet.

Tumour in the brain produces severe headache from the increased pressure, and vomiting, convulsions, and giddiness. A cerebral tumour may produce hemiplegia and other signs of hæmorrhage. A cerebellar tumour causes an uncertain, staggering gait.

Treatment.—Means to relieve the headache are tried; quiet, ice, lotions, and leeches. Sometimes the operation of trephining is performed, a circular piece of bone is taken out of the skull to relieve the pressure.

The nurse must notice the nature of the convulsions; the place where they begin, whether the patient has any curious sensations anywhere, contraction of the fingers, etc. These fits are often repeated, and if the nurse misses the beginning of one, she may happen to see another in a few minutes. When the doctor knows what muscles are first attacked, he knows what part of the brain is affected, and this knowledge is a valuable aid in diagnosis.

Paraplegia—loss of power in both legs—arises from many causes. A common cause is

Myelitis, acute inflammation of the spinal cord. It is brought on by exposure to wet and cold, strain, injury, or is a consequence of tumours pressing on the spinal cord or of spinal caries. The first indications are numbness, tingling, pain, and cramp, followed by partial or complete loss of sensation and power. There is often hyperæsthesia (increased sensation), in a painful band of skin round the body. The sphincters lose their power. Bed-sores are a great danger in myelitis; they form partly in consequence of the interference with the nutrition of the part affected. Bed-sores sometimes are the actual cause of death, and death sometimes results from consecutive nephritis after cystitis—*i.e.* the inflammation spreads upwards from the bladder to the kidney, where it causes fatal disease. Another fatal complication of myelitis is pneumonia.

Treatment.—The patient must be put on a water-bed, and the greatest care taken as to cleanliness. In spite of every care blebs may form, which become acute bed-sores in a few hours. Inform the physician at once if this occurs. Try to prevent them by varying the position of the patient. There is loss of sensation in the skin, which will prevent him from knowing if he is being burnt by a hot bottle, and it is very difficult to heal any injury to it; the nurse must therefore be most cautious in the use of hot bottles. Retention of urine must never be allowed, and all catheters used must be carefully sterilised by boiling.

The medicines generally given are tonics, iodide of potassium, and mercury.

Neuritis—inflammation of the nerves—is frequently due to alcoholism. It affects the ends of the small nerves and causes wasting and loss of power in the limb. Plumbism also causes neuritis, but chiefly in the arms, where it is known as "wrist drop." It also follows diphtheria, and is then called diphtheritic paralysis. All these poisons—viz. alcohol, lead, and the diphtheria poison—circulate in the blood, and set up weakness of the limbs, and loss of sensation or increased sensation. There is often tenderness in the calf. The neuritis may be so severe that there is almost complete absence of power in every limb; and serious

contractions of the limb sometimes follow. The memory becomes defective, and the patient has delusions. The bladder and rectum are not often affected in neuritis.

Treatment.—Rest in bed, no alcohol, liniments rubbed in to relieve the pain. There is less tendency to bed-sores than in myelitis, but they must be guarded against. Galvanism and massage are useful.

Sciatica is neuritis of the large nerve running down the back of the thigh. The worst pain of sciatica is felt at those parts where the nerve comes to the surface—viz. the back of the thigh, the back of the knee, and the outside of the knee. It is frequently treated by blisters, but rest in bed is essential.

Epilepsy is due to a functional disorder—that is, there is no alteration in the organs of the body, for nothing abnormal is to be seen in the post-mortem of an epileptic; but for some reason or other the organs are not working properly. Epilepsy is a functional, apoplexy an organic disease. Epilepsy is characterised by sudden losses of consciousness, with or without convulsions. It is common in young females with a family history of nervous disease or insanity.

There are four stages in an epileptic fit—

1. Aura, or premonitory symptoms, are peculiar sensations preceding the unconsciousness for a short time. They vary with the patient; but he knows them, and recognises that a fit is coming on. The aura may be something definite, as twitching; or may be loss of sight, curious smells, flashes of light, or hallucinations.

2. Unconsciousness and contraction of the muscles is the next stage, and is often ushered in by a sudden cry. The patient is blue, and stiff, this condition lasting for a few seconds or a minute.

3. Convulsions. The patient froths at the mouth, passes his motions under him, and is quite unconscious, his eyes even being insensitive to touch. He probably bites his tongue.

4. Recovery. After some time, which is of very various lengths, he gradually recovers consciousness, but remains drowsy, sleepy, and dull for some time.

If death takes place during a fit, it is from some accident—suffocation from the bed-clothes, burning from having fallen into the fire, drowning, or clothing.

Treatment.—Light food, regular exercise, and bromides as medicine. The fit may be stopped in some cases by rubbing the limb, or constricting the finger or arm with a tight string. Put in a gag to prevent the patient biting his tongue—a bit of wood will answer, or the handle of a toothbrush.

Convulsions in children may usher in an acute disease, being equivalent to a rigor in an adult. They are especially likely to happen at the beginning of scarlet fever, pneumonia, and measles.

Convulsions are also caused by brain disease, and in exhaustion from diarrhœa, and they are common in rickety children. Worms, and other forms of irritation, and whooping-cough, bring them on. But a convulsion in a child may mean epilepsy. Put the child in a warm bath, and then to bed; take his temperature. The doctor will probably order a purgative, and if the fit is very persistent may give him chloroform at the time and bromide of potassium afterwards.

Concussion is produced by injury to the head, as from a blow. There is a sudden loss of consciousness, with feeble action of the heart, and respiratory muscles, causing a weak pulse, pallor, and coldness of the skin. In a slight case, the insensibility lasts only a few seconds, but some grave cases remain unconscious till death ensues.

In an ordinary case, the patient becomes conscious gradually; he probably vomits, and complains of headache, and his shallow, irregular breathing becomes stronger. During the unconscious stage, he must be put to bed, and made thoroughly warm with blankets and hot bottles. He must have no stimulants, and there is no need to try to feed him, unless the condition lasts many hours. When he begins to recover, he is fed with small quantities of milk, about one pint in twenty-four hours, and he must still be kept quiet in bed. Epilepsy or insanity may follow a severe injury to the brain.

CHAPTER XXXI

INFECTIOUS DISEASES

THE infection of scarlet fever, enterica, diphtheria, and all other infectious diseases, spreads by means of germs or micro-organisms. Each infectious disease has its own germ, which can reproduce the disease when it is conveyed to a suitable place for its growth, in something the same way that a seed will reproduce the plant it came from. The germ enters the body by means of the lungs, alimentary canal, or the skin. Germs are of many sorts, and are found everywhere, so that poisonous as well as harmless germs must be constantly entering the body; but they are prevented in most cases from doing any harm by the antiseptic action of the blood. It does not follow, therefore, that everyone who is exposed to infection will contract the disease from which the germ sprang.

The time from the entry of the germ (exposure to infection) and the onset of the symptoms is known as the incubation period. The patient notices no symptoms and does not know that there is anything amiss. This incubation period is of different length in different diseases; it is short, one or two days, in scarlet fever, and may be as long as three or four months in hydrophobia. Then follows the onset, when the patient begins to feel ill. The first symptom may be a rigor, as often happens in scarlet fever, while the onset of typhoid is gradual, and the patient complains of headache, want of appetite, and a general feeling of illness for several days. Each infectious disease has its own characteristic course, temperature, duration, and termination, and the virus of the disease is conveyed in different ways. In enterica, the stools convey the infection, in scarlet fever the skin gives it off, in diphtheria the membrane carries it, and the breath

is infectious in small-pox and typhus. All these fevers are infectious from the very first symptoms. Some infectious fevers give immunity from succeeding attacks—*i.e.* the patient is not subject to the chance of infection again; it is rare for a person to suffer a second time from measles, scarlet fever, and small-pox; but typhoid and diphtheria give no immunity, and second attacks of these are not uncommon.

Isolation of the patient is the first step of the treatment. Let him be in a separate building if possible; at least, put him into a room at the top of the house where there will be no passing and repassing the door. Hang a carbolic sheet outside the door, and keep it constantly wet with a five per cent. (1 in 20) solution of carbolic acid, for the sake of disinfecting the air that passes out of the room. Allow no one in the room except the nurse and the doctor. Ventilate the room well, keeping the window open day and night, and never letting it feel stuffy. See that the fireplace is not blocked up. And keep the patient in bed, and shelter him from draughts, at least until his temperature is normal. Mark every cup, plate, etc., that is brought into the room, and immerse everything in a strong disinfectant before it is taken away. Destroy any remains of food in the room, lest it should accidentally be used again. Before the patient is isolated, the room should be cleared of all superfluous furniture and curtains. Disinfectants must be freely used in drains, cisterns, etc.

It is also necessary to be careful in the wards in nursing syphilitic patients; separate cups, medicine glasses, forks, and spoons, and bed-pans, should be kept for their exclusive use.

Before scarlet fever patients are allowed to mix with other people they must be disinfected by the use of carbolic baths; and particular attention must be paid to the nails, scalps, and hair; and the patient must put on entirely clean clothes, those that he has worn before the attack being burnt, or else disinfected by thorough baking. Where it can be done, the carpet, mattress, and everything on the bed may be destroyed; failing this, they must be baked or steamed in a suitable apparatus.

Never let any toys, books, etc., be carried from a child with any infectious disease to another, no matter how well they may have been baked. Cleanse the room with carbolic soap, and scrub the furniture well. During the course of illness it is a good plan to keep a carbolic spray playing in the room, and you do much to prevent the spread of disease by receiving sputum and fæces directly into a disinfectant.

The room is disinfected, after the removal of the patient, by the use of sulphur or chlorine. For a room of 1000 cubic feet a pound of sulphur is necessary. Shut every cranny in the room, pasting paper over the cracks of the windows, and over the fire-place; open drawers, cupboard doors, etc. Put the sulphur in an iron shovel, on the top of an inverted bucket, light it with a little methylated spirit, and go out of the room instantly and shut the door, pasting up the cracks and pushing tow into the space under the door. Then leave the room for ten or twelve hours, and be careful in first entering the room when it is opened. Air it well, leaving doors and windows wide open all day.

If the patient dies, the body should be washed with carbolic lotion.

After people have been exposed to infection, they should be kept in quarantine for various times, depending on the incubation period of the disease. For example, if a child was exposed to scarlet fever, he should be kept apart from other children for a week, and would then probably be safe; whereas after being exposed to German measles he could not be considered safe from the infection for a fortnight.

The nurse must take the same precautions in disinfecting herself that she takes for her patient. She must have a carbolic bath, and put on entirely fresh clothes after it.

The following table shows the period of incubation of some of the principal infectious diseases, the period of preliminary fever before the characteristic rash appears, the duration of the disease, and the length of time before the patient can be considered free from infection:—

	Period of Incubation.	Pre-liminary Fever.	Duration of Fever.	Time before freedom from Infection.
Chicken-pox .	7-14 days	1 day	5-10 days	A week after the last crust has disappeared.
German Measles	12 ,,	1 ,,	3- 5 ,,	A fortnight after the rash has disappeared.
Scarlatina . .	3- 5 ,,	2 days	7 ,,	Six weeks at least when desquamation has quite ceased.
Small-pox . .	12 ,,	3 ,,	7 ,,	Six weeks after all the crusts have gone.
Measles . . .	14 ,,	4 ,,	5 ,,	About a month, if there is no discharge, cough, or desquamation.
Typhus . . .	7-14 ,,	5 ,,	14 ,,	As soon as the patient is convalescent.
Typhoid . . .	10-14 ,,	6-10 ,,	14 at least	As soon as the patient is convalescent.

The diagnosis of infectious diseases depends on the rash, the state of the throat, the intestinal symptoms, skin symptoms, and temperature. Another guide to diagnosis is the length of time between the infection and the first symptoms, or between the first symptoms and the appearance of the rash. The following sentence helps to fix in the mind the day of the illness at which the rash appears :—

Very	Varicella	In the first day
Sick	Scarlatina	,, second day
People	Pox (*i.e.* small-pox)	,, third day
Must	Measles	,, fourth day
Take	Typhus	,, fifth day
Ease	Enterica	,, sixth or following days

If the fever lasts more than twelve days, and the patient has no rash, he can have none of these diseases except enterica.

In **measles** the spots are often crescent-shaped, and sometimes nearly livid. They begin in the face, with very bright and definite colour, and the whole face is affected. The spots run together, and flat lumps are formed, but the skin between the spots is not altered in colour. The rash is soft and velvety to the touch.

In **scarlatina** the rash begins in the neck and chest, and then spreads to the soft skin inside the knees, elbows, and groins, and the face. But the lips and chin are not affected. There is an "oral circle" of normal skin round the mouth, which helps to distinguish scarlatina from measles. In both these diseases the rash may be photographed twenty-four hours before it is visible to the eye.

German measles is quite distinct from both of these, and does not protect from either of them. There are points of similarity in the rash; the pimples are more like scarlet fever, but the skin between is not red.

In **chicken-pox** crops of spots come out at various times, so that they are in all stages at the same time, some beginning, while others are pustular, or vesicular, or disappearing. Perhaps there are only a dozen altogether.

In **small-pox** the pocks are dotted all over the body, and may cover it in the course of twenty-four hours. They can always be felt before they are seen, and they feel like small shot under the skin. They are often to be seen on the soft palate. The eruption becomes vesicular about the third day, and pustular about two days afterwards. About the 11th day the scabs begin to form, and when they fall off, the characteristic scars of small-pox are seen.

In **typhoid** the spots come out in crops, and last three or four days. Sometimes there are no spots at all, and often only very few, but occasionally they cover the whole trunk, and are also found on the limbs and face. They are rose-coloured, raised, and disappear on pressure.

In **typhus** there is a mottled look about the eruption, and later on it looks like flea-bites.

Scarlet fever is only another name for scarlatina. One is not a mild form of the other, the two words denote the same thing. It begins suddenly, generally about three days after taking the infection. There may be a rigor as the first symptom, and this is quickly followed by sore throat, vomiting, headache, and feeling ill all over. The tongue is furred, the temperature rises

to about 103 or 104 degrees, and the pulse is probably 150 if the patient is a child.

Any child with sore throat and a rapid pulse should at once be isolated from other children, as in all probability he is suffering from scarlet fever. And if any one nursing a case of scarlet fever has a sore throat, she may carry infection to others.

When the rash, which is a uniform bright scarlet colour, has fully come out, the temperature begins to fall, and it becomes normal again in three or four days. At the end of the rash the patient begins to peel, or desquamate. This is a very distinctive sign of scarlet fever, and there is no freedom from infection until the whole skin has peeled off, which it does in very small flakes.

Sometimes a patient is extremely ill, with raw throat and white, furred tongue, but no rash. A hot bath may bring out the eruption, and it is certainly delayed by cold.

Scarlatina varies enormously in virulence. A person may catch the infection from a mild case, and yet die himself within twenty-four hours. It is a disease which has many complications, of which the most frequent are rheumatism, inflammation of the kidneys, and ear disease.

The patient must be kept in bed for at least seven days, and if there is any fear of exposure to draughts, or any sign of complication, for as much longer as is necessary. The diet must be chiefly milk for the first week, and, on account of the difficulty in swallowing, nothing else will be wanted. The bowels must be opened without fail every day, and a hot bath given three times a week while peeling. Warm syringing relieves the pain in the throat, and the nose and ears must also be syringed if there is the least discharge. The inflammation in the throat often spreads up the Eustachian tube into the middle ear, where it may set up abscess and perforation of the drum, and permanent deafness. So syringe the ear carefully with boric acid lotion, and put in a clean plug of antiseptic cotton-wool twice a day or more, till the ear is quite clear of discharge. A child with commencing ear disease will not lie on that side of his head, he will be fretful and irritable, and if he is too young, or too ill to complain of pain, he will constantly put up his hand to his ear.

Measles—Morbilli—is even a more infectious disease than scarlet fever. It begins like a cold in the head, with running from the nose and eyes. The temperature rises suddenly, and then falls a little till the fourth day of the illness, when it rises again, and the rash comes out, beginning on the face. These first four days, before any rash appears, are the most infectious of the whole time. In two days or thereabouts the rash disappears, and the temperature falls rapidly. But it is necessary to take great care of the patient after he is apparently recovering, as measles is frequently followed by laryngitis, bronchitis, or broncho-pneumonia. Disease of the middle ear often follows measles, in consequence of the sore throat that accompanies it, as well as scarlet fever.

If children die from an attack of measles, it is generally in consequence of one of the respiratory affections, probably broncho-pneumonia.

CHAPTER XXXII

TYPHOID FEVER AND DIPHTHERIA

ENTERICA, or typhoid fever, is a disease that is most interesting to a nurse, from the fact that it is not operation nor medicines that will benefit the patients suffering from it, but faithful and skilful carrying out of the doctor's orders as to feeding, stimulants, nursing, and general management.

The typhoid bacillus, the germ which produces typhoid fever, is generally introduced into the body by drinking water or milk which has been polluted by the fæces of persons suffering from typhoid. So one case of typhoid is always derived from another case, though it may be in a very roundabout way; it does not arise spontaneously. In every case of typhoid, careful inquiry should be made as to the water and milk supply, one of which is very likely to have caused it; and precautions must be taken against the single case becoming an epidemic.

One most valuable precaution is to boil every drop of both water and milk before it is used for food. The water used for washing cups and plates and for cleaning the teeth should also be boiled. The usual way that infection spreads is that fæces, or the germs contained in typhoid fæces, are washed by the rain into the ordinary water supply of a house or a district, the water is drunk or used unboiled, and the disease follows. Or it may be that milk coming from a distance is adulterated with water containing the typhoid bacilli, or that the milk-cans are washed with the contaminated water. An epidemic has often been known to occur in houses supplied by one particular dairy, while houses close at hand, but depending on another milk supply, have escaped.

Another source of infection is sewer gas, in which case the germ is carried by the air that escapes from a faulty drain.

It is important for a nurse to remember that typhoid fæces,

while fresh, are not directly infectious, but become so by being left outside the body without disinfection for a few hours, the length of time depending on the weather. She can therefore prevent infection being carried from the case she nurses, by taking care that the fæces are passed into a vessel containing a disinfectant, and adding more disinfectant before they are emptied away; she must put all soiled linen straight into a covered vessel containing one-in-twenty carbolic lotion; she must wash the patient thoroughly, no matter how often it has to be done, and she must wash her own hands and nails carefully after she has rendered any service to the patient, especially before she touches any food. If she does all this, it is not likely that the disease will spread to anyone else, and she does not run much risk of catching it herself, if she will take reasonable care of her general health, by having a proper amount of sleep, taking some outdoor exercise every day, and eating plenty of good wholesome food, *out of* the sick-room.

Typhoid fever produces ulceration of the intestine, generally of the small intestine near the cæcum, but sometimes spreading through the whole length of the bowel. The parts of the intestine affected are chiefly the small groups of glands known as Peyer's patches. These become inflamed, and break down and slough, in much the same way that an ulcer on the skin forms. This ulceration is one great danger of the disease. When the slough separates, the ulcer is found to have eaten away and thinned part of the muscular coat of the intestine. It may eat through the wall of one of the blood-vessels supplying the intestine, and set up hæmorrhage, which is often severe, or even fatal; or the thinned bit of intestine may give way altogether, and through the hole left in it the contents of the intestinal canal will pass into the peritoneum, and almost certainly cause peritonitis and death.

Typhoid is most frequent in young people from fifteen to twenty-five. When children get it, the attacks are mild, as a rule. Alcoholic persons generally do badly. It is much better for patients to take to their beds at the first symptoms of illness. If a man tries to do his daily work till his temperature is 103 or 104 degrees, he has a hard struggle to pull through.

It does not begin suddenly. The patient feels tired, has a headache, and is not fit for work. In a day or two his headache is worse, he has pains in his limbs, and is drowsy and hot. He loses his appetite, and may have a cough, and perhaps some diarrhœa. But there may be no distinct symptoms at first, except the temperature, which is most characteristic of the disease. It rises for from four to seven days by steps, being higher at night than in the morning, falling the next morning about a degree and rising two degrees at night, until it is 103 degrees or higher. By the time the temperature has reached its height there are more symptoms, very likely diarrhœa, with its typical pea-soup stools, and spots by the end of the first week. (Not every adult case of typhoid has spots, and they are seldom seen in children.) They come out in successive crops, and not all at once, as the rash of measles appears. A large number of spots seems to show that the illness is a severe one. There is often a little bronchitis beginning at this time.

In the second week the patient gets thin, the spleen is enlarged, and the temperature remains at the same height, and keeps so till the end of the third week, or later. It is always satisfactory to see a little drop in the temperature some time in the day; the patient is not in a very hopeful state when his temperature runs a straight line along 103·5 or 104 degrees. A sudden fall from this height to normal or sub-normal should always put a nurse on the alert, as it may mean hæmorrhage, for a typhoid temperature never falls like a pneumonia, with a sudden crisis. But sometimes one of the first signs that the fever is coming to an end is a sudden drop of several degrees which lasts an hour or two. The fall of temperature is not therefore an invariable danger signal, unless it is accompanied with actual hæmorrhage from the bowel, or with signs of internal hæmorrhage—viz. pallor, collapse, a quickened pulse, or actual hæmorrhage from the bowel. About the end of the third week, in a slight case, the evening temperature is a little lower than on the previous day, and it falls, very slowly, to normal.

During the first week of the fever the Peyer's patches are inflamed and swollen; in the second week the ulcers are

formed, and in the third week the sloughs begin to come away, and the dangers of perforation and hæmorrhage are at their height. It is in the third and following weeks of a bad case that the patient looks at his worst. He lies on his back, half-unconscious, or with muttering delirium; with dry, cracked lips and a dirty, furred, tremulous tongue, picking at the bed-clothes, and still more at his lips, and often refusing his food. He may go on in the same condition for two or three weeks, or longer, before the least change for the better is seen. But typhoid is a disease where a nurse need never give up hope, for patients have been known to recover from it when there has seemed to be no chance of recovery for many days together.

It is peculiarly liable to relapses; it is quite impossible to predict how many weeks or months it may last. It is, however, a rare occurrence for a patient who has struggled through the first attack to die in a relapse.

Death may take place from perforation causing peritonitis, signs of which are sudden distension of the abdomen with severe pain, persistent sickness, and a feeble, quick pulse. It is generally fatal in a day or two. Or severe hæmorrhage which cannot be controlled may cause death; and sometimes cardiac failure, or pneumonia, bronchitis, peritonitis, or general exhaustion from the poison of the disease, brings it to a fatal termination.

When a patient is coming into the ward with the diagnosis of typhoid, prepare a suitable bed for him. It should not be near the door, where the constant passing will disturb him, nor yet in an out-of-the-way corner, where the night-nurse cannot see him without making a special journey. The bed must have a mattress and one pillow, or perhaps a second small feather pillow may be allowed, and a mackintosh and draw-sheet must be used. If the case seems to be a bad one, the mattress had better be protected by a long mackintosh under the blanket. One top blanket will be quite enough, except in very cold weather; a typhoid patient does not need heavy coverings to keep him warm. He must be laid on the bed directly he comes in, and undressed there, not being allowed to do any-

thing for himself, for the nurse does not know the stage at which the illness has arrived, and it might be just the last effort of undressing that would cause a thin bit of intestine to give way and perforate. He must be washed carefully, being rolled from side to side, and not sat up in bed; and the abdomen must be washed lightly. If there are any ink marks round suspicious-looking spots, they had better be left as the doctor made them. Dress the patient in a cotton shirt that opens down the back, or one that has been slit up to the yoke, so that there is no struggling to get it on over the shoulders. Put up a four-hour chart, a specimen of urine, and save the stools for the doctor to look at, keeping them somewhere out of the sick-room. Mark the feeder, medicine-glass, spoon, washing-basin, porringer, spit-cup, and bed-pan with a bit of strapping on which is written the number of the bed or the patient's name. Send all the clothes he wore on coming in to be disinfected; it is dangerous to let them be taken home without this precaution.

Milk is the great food for typhoid patients, because it is, or ought to be, properly digested before it reaches the ulcerated intestine, and no hard residue is left to scrape the raw surface and cause bleeding or perforation. An adult should take three pints of milk in twenty-four hours, divided into five ounces every two hours, with the addition of half the quantity of thin, carefully strained barley-water. Lime-water is used sometimes instead of barley-water. The object of this is to render the milk more digestible. Soda-water is occasionally ordered with the milk, but although it is pleasant to the taste, it is apt to cause flatulence. If any curdled milk is vomited, or passed in the stools, peptonise the milk. When the patient gets so tired of it that he will not take his proper quantity, flavour it with a *little* strong tea or coffee, or even cocoa. Jelly is generally allowed, and broth and beef-tea, well strained, are ordered if there is no diarrhœa; they must be given lukewarm, and not hot, in quantities of five ounces at a time. Occasionally, a very manageable patient will take three or four feeds of beef-tea in addition to his two-hourly feeds of milk, but more often you will have to substitute beef-tea

for milk about three times a day. The patient *must* take his food regularly, and he is often very tiresome about it, almost fighting against every spoonful given him. Now and then it is less exhausting for the patient to have his food through a nasal tube for a few times, than to struggle over it each time of feeding; but a good nurse will generally manage to coax and humour the half-delirious patient till she gets him to swallow it. Vomiting in typhoid is a serious thing, partly on account of the loss of nourishment. It is sometimes treated by drugs, and sometimes by entire change of food for twenty-four hours—perhaps albumen water and raw meat juice instead of milk.

When the temperature has been quite normal for seven or eight days, a little change of diet is allowed. An egg beaten up in milk is often the first step, and then a soft custard, without any bits of egg-shell left in it; then follow bread-crumbs soaked in boiling milk, and well beaten up till they are perfectly soft; thin bread and butter without any crust, soft-boiled eggs, well-cooked farinaceous puddings, pounded meat, a boiled sole, and so on, until he reaches full diet, which even then should not include salad, fruit, nor anything hard to digest. Never put anything on a typhoid's plate that you do not mean him to eat; he will be so hungry during his convalescence that he is not to be trusted with crusts, fish skin, etc. Give him plenty of milk all through; it takes a great deal of nourishment to get him back to the state of health he was in before the illness.

It is of extreme importance that the feeding cups should be kept clean; the patient's mouth is so dirty and crusted round, that the spout needs a good deal of attention. It must be scalded out every time it is used, and kept clean inside and out. A feeder without any strainer inside is the best, as a bit of rag can be pushed right through the spout to clean it. Burn the rag afterwards.

A patient should be sponged all over when he is washed in the morning; and his face, chest, and arms, at least, should be sponged again when he is settled up for the night. Keep his mouth clean with a wash of formalin or some other disinfectant, and use glycerin and borax afterwards. Encourage him to

sleep as much as he can, and do not let him have books or newspapers unless he is very anxious for them. Keep his friends away as much as you can, unless they can be trusted to sit by him quietly, without talking and disturbing him. Retention of urine is not uncommon; it should not go on for more than twelve hours without attention; and when he has reached the stage when all evacuations are passed under him, notice if a sufficient amount is passed. Watch the abdomen for any distension; the intestines often get full of gas, which causes discomfort and a certain amount of danger. The rectal tube or a turpentine enema may be ordered to relieve it. Constipation and diarrhœa are about equally common in typhoid: for the former, a soap enema is generally given every four or five days; and if the motions are more frequent than about four times a day, a starch and opium enema may be ordered to stop it.

The first sign of hæmorrhage is often a pinkish tinge in the pea-soup-like motions; the doctor should know of the first appearance of this, as he may wish to give drugs to check the hæmorrhage. If there is any delirium, the patient must be carefully watched, or he will sit up in bed, or get up and walk about, and may thus do himself great injury. He must be moved gently, but should not be left for many hours lying flat on his back without being turned a little on one side, propped over by a pillow, both for fear of bed-sores, and of hypostatic pneumonia. Watch the pulse frequently, if it does not worry him; the pulse in typhoid is not rapid in proportion to the temperature, and a pulse above 120 in a minute is rather serious.

Do not be anxious to make the bed too often. If the patient is lifted out on a stretcher or another bed once a week or so, he will do very well. Do not let him sit up in bed, till he has the doctor's permission, and the first day he gets out of bed it will be quite enough for him to sit on a chair for five minutes while his bed is made, or to move about a little on a wheel-couch. Watch his temperature for weeks after the fever has disappeared, and if it shows signs of a relapse, be merciless in restricting his food again to milk until the doctor has seen him and pronounced upon it. Do not hurry his convalescence, unless he is one of those

rare individuals, who will take no steps of their own accord towards dropping their invalid habits.

Remember that, if a relapse occurs, the treatment is exactly the same as that of the original attack; there must be no abatement of precautions, and seven days or more must again elapse after the fall of temperature before any addition is made to the milk diet. Persons who are most patient through the first attack often get restive in repeated relapses, and it is an almost equally trying time for nurse and patient. But she can always comfort his friends by saying that a relapse is hardly ever fatal.

Hyperpyrexia in typhoid is treated by sponging, cold packs, ice cradles, cold baths, and sometimes by the continuous bath.

Many cases of typhoid recover without any drug or stimulant. Brandy is given when there is a weak pulse or other signs of exhaustion, but in small quantities to begin with; two ounces in twenty-four hours is generally enough at first, and more than six or eight ounces in a day is seldom given. Champagne in one-ounce doses is sometimes substituted for brandy, or given alternately with it. Stimulants, of course, are never given, except with express orders from the doctor.

In hospital at least, the friends must be carefully warned and watched, or they will bring in grapes, oranges, jam tarts, or anything else that the patient has a fancy for. Fruit is one of the things likely to be most injurious, on account of the hard seeds and pips contained in it.

Diphtheria is a very infectious disease, the infection being carried in the discharges and the bits of membrane from the affected surfaces, which convey the germs through the air, by means of clothes, instruments, the milk and water supply, and bad drains. Children suffer from it more frequently than those above ten years old, and it occurs often in children who have lately been attacked by scarlet fever or measles, and in any persons exposed to its infection in bad hygienic conditions.

A special germ has been discovered which is almost always found in cases of diphtheria, and is known as the Klebs-Loeffler bacillus. It enters by the respiratory tract, and has a short

period of incubation, from two to five days. Diphtheria does not begin with a rigor; the first symptoms are loss of appetite, general malaise, headache, nausea, and vomiting. There is inflammation of the mouth, pharynx, nasal cavity, and larynx, probably severe sore throat, with pain in swallowing. Dirty greyish patches form on the mucous membrane, which are very characteristic of diphtheria, especially if they occur on the soft palate and the uvula. The glands at the angle of the jaw are swollen and painful. The temperature and pulse are raised, and albumen is present in the urine. If the nose is affected, there is a foul discharge and some bleeding. When the inflammation spreads to the larynx, there is a croupy cough, and difficulty of breathing, with "sucking in" of the chest wall. The face wears a terrified expression, and is bluish in colour, and wet with perspiration. The child is extremely restless, and clutches at its throat, hoping for relief in that way, and is in imminent danger of suffocation.

Besides these original symptoms, very grave complications often arise, especially bronchitis, and broncho-pneumonia and paralysis. Paralysis is not uncommon after diphtheria; it affects chiefly those parts of the body which have been first affected by the disease. It begins generally in the soft palate, and the signs of it are regurgitation of fluids through the nose, difficulty in swallowing, and a change in the voice—the patient "speaks through his nose." The muscles of the eye may be paralysed, causing a squint; the pulse is quickened, and the paralysis may affect the arms and legs, causing difficulty of walking, loss of sensation in the fingers, etc. When the paralysis is in the throat, there is great danger of the patient being choked while swallowing. He can swallow solid food better than fluid as a rule, but solids *may* stick in his throat and choke him before a doctor can be fetched to perform tracheotomy. So the patient is fed on milk, eggs, and beef-tea, which are thickened just enough with corn-flour or arrowroot to prevent their being returned through the nose. But the most serious paralysis is that which affects the heart. Persistent vomiting is one of the symptoms of it, and it almost always ends fatally in two or three days. It is on

account of the feebleness of the heart in diphtheria, and on account of the chance of paralysis, that we keep patients with diphtheria lying flat in bed for three weeks or thereabouts. When nursing diphtheria, the nurse must be careful to cover any scratches she may have on her hands and face, as the membrane will infect every raw surface, and the child is very likely to cough into her face and convey the infection to any sore place on it.

It is not possible to be sure that a case is one of diphtheria, until it has either proved infectious, or paralysis has followed it.

Treatment.—The patient must be kept strictly in bed, and fed with nourishing liquid food. Very likely a stimulant will be ordered for him. If the larynx is affected, the air he breathes should be moistened with a steam-kettle, especially if the weather is cold. The room should be kept warm, about 65 degrees, and the ventilation must be managed without exposing the child to breathing cold air. When the dyspnœa is extreme, a hot bath with mustard in it, and hot applications to the throat, may do good. Watch the child constantly at this stage, as he may need tracheotomy at any moment. Get all the necessary things ready for the doctor's use, just as if you were certain that he would operate. Remember to have amongst them a small hard pillow, to put under the child's neck, to keep the throat on the stretch (a roll of tow wrapped in mackintosh will answer, or a rather firm sandbag); tapes, cut ready for fastening on the tube; feathers for the doctor's use; and the ordinary materials for a small operation.

The tracheotomy nurse's great object is to keep the tube clear and in its place. At the operation, a silver tube is inserted into the trachea, and tied in with strong tapes, and inside this another tube is slipped, which can be removed for cleaning. The nurse must on no account untie the tapes to change them or to take out the tube, it is only the inner one that she may remove from time to time to clear out the mucus. Neither should she poke feathers down the tube to clear it out; she will very likely do more harm than good by irritating the trachea.

When the outer tube is removed by the doctor, the nurse must be quick in washing it thoroughly in soda and water, fitting

it with new tapes, and oiling it. If it is to be left out for a few minutes, there may be time to boil it. She must be especially watchful of the patient at the time the tube is first left out, noting if there is any blueness or difficulty in breathing, whether the patient is awake or asleep; and she should have the dilating forceps always at hand.

In some cases a tube is passed through the child's larynx instead of an opening being made in the trachea. This is known as intubation.

Antitoxin is usually injected as soon as the case is diagnosed as diphtheria. Antitoxin is the serum of the blood of a horse which has been rendered immune to diphtheria, by being inoculated several times with the bacillus of diphtheria. The horse does not suffer from the disease, but the antitoxin is developed in its blood which has the power of killing the diphtheria bacillus. The process of immunity takes four or five months. Then the animal is venesected—the operation is a painless one—and when the blood has clotted, the serum containing the antitoxin is taken for use. It is injected with a special syringe into the loose tissues of the body, about an ounce being used at once. When the bottle has been opened for use, it should be corked again as soon as possible, and kept in a cool place.

Sometimes the nurse has to make applications to the child's throat, or to do other services for it in which it is very likely that membrane or discharge will be coughed into her face. She should wear some protection, as a piece of antiseptic gauze, over her face, or at anyrate should be careful to keep her mouth shut, and to bathe her eyes with boric acid lotion afterwards.

If the doctor wishes that the pieces of membrane coughed up should be saved, they are kept in a corked bottle containing spirit or carbolic lotion.

Adults suffering from diphtheria do not often need tracheotomy, as their larynx is so much larger than a child's that it is not closed up entirely by the inflammation. But it is always a very serious disease.

If the child is to live, it must take plenty of food, for diphtheria

is an exhausting disease, and you cannot wait to feed it till its throat becomes less painful. When it is quite impossible to make it swallow of its own accord, a rubber tube must be passed down the nose to feed it, but do all you can to make it take its food in the natural way. When liquids "go the wrong way," it is a good plan to lay the child with its head hanging over the edge of the bed, and to feed it in this position.

Keep him warm, but do not let the temperature get too high, which it may easily do, as the bed is probably near the fire with a steam-kettle at the side of it. And remember that when anyone can breathe only with difficulty, it is of great importance that the little air he can take in shall be of good quality. Do not let the child be in a draught, nor chilled in any way, but keep the air fresh.

The accidents that may happen in a case of tracheotomy and the line of treatment that the nurse should follow, can be laid down pretty clearly.

1. The tube may have been tied in too loosely, or the child may have pulled at it, and it slips out of the trachea. It is plain to see what has happened, as the tube projects out of the wound, instead of the plate resting against the neck. If you are *certain* this has happened, the only thing is to cut the tapes and take the whole tube right away—it can only do harm now by pressing against the outside of the trachea. Do not try to push it back, you will only do harm by forcing it down into the soft tissues. Stretch the child's neck a little, and it will possibly breathe quietly till the doctor comes; if it is much distressed for breath, put in the dilators carefully and keep them there till help comes. It is rather difficult to introduce the dilators when the child is restless, and the light probably bad. The chief things to remember are these:—Do not turn up the handles of the dilators before they are *in* the trachea; and use no force. If they do not go easily, it is because you have not put them into the trachea; they will slip down quite easily if they are in the right place.

2. Mucus or membrane or blood may choke up the tube, and the child cannot breathe. Then take out the inner tube and clean it.

3. There may be a large piece of detached membrane, too large to be coughed up through the tube, and causing sudden dyspnœa. In this case, the *experienced* nurse will probably have the doctor's permission to remove the tube on her own responsibility if she feels sure that the child will die before help comes, but a nurse with only little experience would be ill-advised to remove the tube, and if the doctor did not blame her for the child's death, she would certainly feel herself as if she had caused it.

Whatever you do for the child, never attempt to clear the tube by sucking it. It has often been attempted, and in most cases the person who sucked the tube died of diphtheria, and the child also.

APPENDIX A

RULES FOR NURSING INFECTIOUS CASES

The following are the instructions issued in Guy's Hospital to nurses engaged in attendance upon infectious cases :—

General Directions

(1.) Never go on duty fasting.

(2.) Always wash and disinfect your hands immediately before handling food, or serving meals, or taking food yourself.

(3.) If you have the slightest sore throat, report yourself at once to the Sister. The sore throat, even though slight, may be diphtheritic, and may lead to a severe attack of diphtheria in one of your patients.

Diphtheria and Scarlet Fever

(1.) When looking at, or making an application to a patient's throat, or when attending to a tube in a case of tracheotomy, cover your face with a piece of antiseptic gauze as a veil, and keep your mouth shut. The gauze should be burnt immediately after use.

(2.) Always have a porringer containing antiseptic liquid at hand, in which to place tongue-depressors, spatulæ, and other instruments, after use. Never put instruments down on the nearest locker or table.

(3.) For wiping away discharges from the mouth, nose, or ears, use pieces of rag or mops of cotton-wool, which should be thrown upon the fire immediately.

(4.) To syringe or flush out a child's mouth or nose; wrap the child round the body and limbs in a sheet or large towel. Hold the child under your left arm, face downwards, over a basin. Use the syringe slowly, and stop the flow occasionally. Always disinfect the syringe after using it.

(5.) Note carefully whether the act of drinking causes the patient to cough, and whether liquids come back through the nose, or escape at the tracheotomy wound; and if so, report at once to the Sister. In any case, do not let the patient attempt to swallow large quantities of liquid at a time.

(6.) When a tube is being passed through the nose into the stomach, the head should not be bent either backwards or forwards, or to the side. Smear the tube with vaseline or glycerin. If the nose is blocked, syringe it out first. If, by passing the tube, coughing is set up, withdraw the tube at once, and try again. Before pouring the milk or beef-tea down the tube, look, if possible, into the child's mouth; for some children have a trick of directing the tube into the mouth, where it lies coiled up.

(7.) Burn any membrane that may be coughed up. If directed to preserve it, put it in a test-tube with some plain water, and plug the tube with cotton-wool.

(8.) It is dangerous to kiss a patient suffering or convalescent from an attack of scarlet fever or diphtheria, however mild.

(9.) Wash and disinfect your hands after syringing out the mouth, nose, or ear, or changing the tube.

Enteric Fever (Typhoid)

(1.) Pour a little disinfecting fluid in the bed-pan before use, and add some immediately after use.

(2.) Soiled linen should at once be removed from the ward and placed in the receptacle provided for it.

(3.) Never omit to wash your hands in antiseptic solution after removing soiled linen, no matter how often you may have to do it.

Phthisis

The expectoration should always be received in a porringer containing water. It should never be received upon handkerchiefs, and if linen rags are used for this purpose, they should be burnt immediately. If allowed to dry, it becomes a serious means of infection.

APPENDIX B

FEEDING CHILDREN

THE following instructions are taken chiefly from two leaflets issued for the use of the out-patients of Guy's Hospital, on "How to bring up Children," and "Feeding Infants":—

1. Keep them warm. Give them plenty of fresh air; take them out whenever the weather is fine. Wash the child all over with warm water daily. If possible let the child sleep in a cot by itself. Open the windows at least twice daily. Keep them open whenever the child is not in the room.

2. If the mother has plenty of breast-milk, the child should *not have any other food whatever*, until it is seven months old. It must be suckled every two hours during the first month, and the interval gradually increased, so that at the end of three months it is suckled every three hours; and when the infant is four months old, it should be fed five or six times during the twenty-four hours. Too frequent suckling is a common cause of the sickness of infants, and does great harm.

3. If the mother has only a little milk, let the child have it, and in addition milk mixed as directed in rule 4. Do NOT on any account give the child any baked flour, arrowroot, cornflour, biscuits, tops and bottoms, or any so-called "infant's food" before it is seven months old. It is a good plan, if the mother has only a little breast-milk, that she should drink a cupful of cow's milk half-an-hour before suckling.

4. If the child must be brought up entirely by hand, it should be fed out of a bottle with cow's milk warmed and diluted. Fresh cow's milk must be used; and if it appears to disagree with the child, a little lime-water or barley-water can be used instead of only plain boiled water to dilute it. If the milk is of good quality, twice the quantity of water should be added to it during

the first month, and a little cream may be added to it; and the quantity of water should be reduced as the child grows older, until at four months there is one part of water, or barley-water, to two of milk. The milk should always be boiled before being used. The number of "feeds" should be the same as if the infant were suckled, and at first they are very small, about an ounce at a time being enough. During the first month, the child requires between one and two pints of the diluted milk during the twenty-four hours. As it gets older, more is required, and at seven months about three pints are necessary.

5. A boat-shaped bottle, without a tube, should be used, and when each meal is over, the bottle must be emptied, rinsed, and kept in clean water until again required. Once a day it should be carefully cleaned with hot water in which a little soda has been dissolved, and rinsed out again with plain hot water.

6. At seven months the child must be gradually weaned until it is ten months old, beginning with one or two meals a day of cow's milk thickened with one or other of the following malted foods—viz. Allen & Hanbury's, Mellin's, Savory & Moore's, or Squire's, the other meals should be of milk only, which will still form the staple article of diet. At eight or nine months it may have broth or beef-tea, in addition to the milk.

7. At one year old the breakfast should be a good half-pint of milk with a little bread in it, or bread and butter; occasionally an egg lightly boiled, or oatmeal porridge. At 11 a little more milk. For dinner, broth, beef-tea, boiled fish, or well minced underdone meat, in turns, with a tablespoonful of either well-mashed greens or potatoes mashed in gravy, and some milk and rice or custard pudding. For tea, bread and butter and a half-pint of milk, and a cup of milk later in the evening if necessary only.

After two years old the child should partake of food four times a day. It must be remembered that children under the age of three years are unable to digest the same food as grown persons. Beer, spirits, cheese, and salt fish are especially unsuitable for young children.

Do not on any account give the child anything between its meals.

"Artificial human milk" is sometimes ordered, and can be obtained from many dairies in London; the following way, however, is sufficiently simple for home use.

Let the milk stand two or three hours and skim off the cream. Divide the skimmed milk into two parts, make one part into curds and whey, by the addition of a little rennet, and add the whey to the other half of the milk, with the whole of the cream, and sweeten it with a little loaf sugar, or sugar of milk.

APPENDIX C

HINTS FOR WARD NURSES

KEEP the day's supply of milk in a covered vessel, in an open-air cupboard. If you do not make a practice of boiling it regularly, at least scald it when the weather is hot.

Raw meat juice should be kept on ice, or it will not keep.

Keep champagne that has been opened standing on its head in the ice-box. If a patent cork is used for it, and air is excluded in this way, it will be good for several days.

The lid of the ice-box must be kept tightly shut, otherwise the ice will melt as fast as if it were kept in an open bucket. Ice that is cracked up for a patient's use is put into a funnel fitted inside a cup, after the fashion of a spit-cup. But ice can be kept very well on a bit of flannel tied over the top of a mug standing in a saucer, especially if it is covered with another piece of flannel. Standing in water melts ice as quickly as exposure to warm air.

Mackintoshes should be rolled, or hung up, when not in use; if they are folded, they wear out in cracks. The old ones should be kept for skin cases, as the greasy ointments used for them are very destructive to any indiarubber goods. If it is necessary to pin a mackintosh in place, put the pin at the very edge.

Spread ointment evenly on the lint, covering the whole surface. Hold the blade of the knife or spatula nearly level, and move it away from you. Fold it over lightly, to prevent its getting dusty before use.

Turn the ward sheets "sides to middle" *before* they have any holes in them. Do not turn draw-sheets, nor patch them anywhere near the middle, as the seam would be hard against the patient's back.

Keep a reserve supply of bandages, dressings, cut lint, etc., and have a locked cupboard in your ward with a duplicate of every-

thing in use, or likely to be wanted. Never give out the last roll of tow, or the last glass funnel, or whatever it may be, without instantly sending for another.

Have a receptacle for odd bits of cotton-wool and gauze that are left in cutting up large quantities. They will be useful some day for colotomy pads, etc. Always air cotton-wool before it is used, cut it into conveniently-shaped pieces, and keep it out of the dust. Roll strapping loosely, with the sticky side inside, and when it is to be warmed, hold the other side towards the fire.

See that oxygen cylinders are properly screwed up when they are finished with. If they are allowed to leak ever so little you you will find them empty the next time you want one in a hurry. A large glass funnel on a piece of indiarubber tubing makes the best mouthpiece for oxygen, as it covers both nose and mouth. It can also be easily disinfected.

Tell a new patient in the possession of money or valuables that he keeps them by his bedside at his own risk. Take away the money of an unconscious or a delirious patient. Always remove the razor, if a patient has brought one into the hospital. Give the valuables of a patient who has died into safe keeping until they are taken away by his friends. Remember to remove the rings before the body is taken away from the ward. Remind the friends to send a clean shirt or night-dress to put on it.

When sending a patient's clothes to be baked or disinfected, turn out the pockets, as there may be matches, etc., in them; and do not send either boots or belts or anything made of leather, which would be spoiled by heat. The clothes of every patient must be examined on admission, and if they are too dirty to be put into the common clothes cupboard, the friends must take them away. If there is any suspicion of vermin they must be baked.

Remember, when admitting a child, to make arrangements for the mother, or some other person with the requisite knowledge, to come to the ward to give the child's history.

Avoid showing alarm at any symptom in your patient while in his presence. Most patients, for example, are excessively frightened at any hæmorrhage, and this is just the time when it is most necessary to keep them quiet.

When a patient is going to a convalescent home, let him have a bath over-night, and use a small-tooth comb for his head, that you may be certain that he is being sent to the home clean. See that he has a proper supply of clean decent clothes, and mark them all.

Do not use a feeder with a broken spout or a medicine glass without a foot. Report anything broken, whether by your own fault or not, that it may be replaced. Never neglect a leaking gas- or water-pipe, and never put away anything out of repair, with the idea that it will be time enough to mend it when it is wanted.

Pad the splints again as soon as they are scrubbed and carbolised.

Do not use good sheets and blankets for a skin case; if none are kept on purpose for such cases, use those that have been put away for the periodical change.

Give clear directions whenever you give an order. Be sure that you have understood the order when you receive one. Don't go round, saying vaguely to the nearest person, "I wonder what the doctor meant," and then proceeding to do what seems expedient to yourself.

If possible, avoid giving any order to a probationer that will take her away from the routine work that she must do at a certain time.

Boil a stomach tube, indiarubber syringe, and everything of the sort that has been used for a patient, before it is put away, but clean it well before boiling. Take the packing off a glass syringe, and repack it with tow and cotton before you boil it.

APPENDIX D

SICK-ROOM RECIPES

Everything used in preparing food or drink for the sick should be scrupulously clean, and iron and tin saucepans are to be avoided; those lined with enamel are preferable, and in most cases, a double saucepan can be used, which avoids the risk of burning the milk or other food that is being cooked. It should be remembered that sick people generally like less flavouring, whether salt or sugar, than is put in ordinary cookery.

Albumen Water

Take the whites of two eggs, remove the specks, and beat them thoroughly. Add them to half-a-pint of water, and beat again all together. Strain before use.

If this is given to a baby, it is enough to use one egg to the same amount of water.

Arrowroot

Take a dessertspoonful of the best arrowroot, make it into a smooth paste with a little milk. Boil half-a-pint of milk, with a lump of sugar if liked, and pour it while boiling on the arrowroot, stirring quickly all the time.

It may be flavoured with ratafia or lemon essence, or with a little sherry, but it is generally preferred plain.

Water arrowroot is made in the same way, using water instead of milk, and it is better not sweetened, but, according to taste, it can be flavoured with lemon and sugar, or with salt, or brandy.

Barley Water

Take two ounces of pearl barley, wash it well in cold water, put it into a saucepan with a pint and a half of cold water, bring it to the boil, and let it simmer gently for half-an-hour. Strain it before use.

If wanted as a drink, and not as an addition to milk, it may be flavoured with lemon and sugar.

Beef-tea

Take a pound of freshly-killed lean beef. Cut it small and put it, with a pint of cold water, into a covered jar in a warm oven until it is cooked. Or it may be cooked in a saucepan over the fire, but it must only simmer, and should not be boiled fast. Skim it now and then, and stir it, whether in a jar or a saucepan. Pour off the beef-tea, when cooked, through a strainer with large holes in it, through which the sediment can pass, and let it stand in a shallow dish till quite cold, when the fat can be removed in a solid cake. A pound of beef ought to produce a pint of beef-tea. If it is boiled down to a smaller quantity, it will be a jelly when cold, and some invalids will take it in that form.

When it is warmed for use, flavour it with salt and pepper. Celery seed, or even a very little onion, if liked, may be used occasionally to vary the flavour.

Beef-tea is served, when solid food is allowed, with very thin, crisp, dry toast cut into fingers or squares.

Broth

Mutton, chicken, and veal broth are made in the same way as beef-tea, in a saucepan over the fire. The broth must be well skimmed. An old fowl will answer the purpose very well, and the lean part of the neck of mutton is used. Both bones and meat are used.

Blancmange

Dissolve one ounce of fine isinglass in a pint of milk, strain it through fine muslin, and put it into a clean saucepan with an ounce of pounded sugar and the thin peel of a lemon. Let it warm very gently till it is nearly boiling, and then take out the lemon peel and pour it into a wetted mould.

Bread Jelly

Soak bread crumb in water or milk for one hour. Boil it in enough water to cover it well for another hour, with the addition

of a little sugar and flavouring. Strain it through muslin or a fine sieve into a shape, and let it stand till cold. It ought to turn out of the shape like blancmange.

Benger's Food

This is very good if it is made according to the directions on the tin it is sold in, or by occasionally using chicken broth in place of milk.

Boiled Custard

Warm five ounces of milk with a lump of sugar and a bit of cinnamon, fresh lemon peel, or a grate of nutmeg. Stir into it a well beaten egg. Put it all into a mug, and place the mug in a saucepan of boiling water, stirring the custard round, always in the same direction, till it thickens. It will probably take a quarter of an hour to thicken. Pour it into little glasses to serve.

A savoury custard is made in the same way, using strong beef-tea and salt instead of milk and sugar.

Baked Custard Pudding

Beat two eggs in a basin or pie dish, stir into it about half-a-pint of cold milk, sweeten it, grate a little nutmeg on the top, and bake it in a rather slow oven till it is set. Do not move the dish about while it is baking, or it will not set firm; and it will not be a success if the oven is so hot that the custard boils.

Cocoa

All cocoa is much nicer if made with boiling milk instead of water, and if it is boiled again for a minute or two before being served.

Cornflour Blancmange

Take two ounces of cornflour, one ounce of sugar, and one pint of milk. Mix the cornflour with a little of the milk into a smooth paste, and boil the rest of the milk with the sugar and a few drops of almond, vanilla, or other flavouring. Pour the mixed cornflour into the milk, stirring it quickly till it is thickened. Pour it into a mould that has been wetted with cold water.

Curds and Whey

Put a pint of new milk in a glass dish, stir into it about two drachms of fluid rennet, and let it stand in a warm place until it is set.

If it is intended for use as a pudding, the milk should be sweetened before the rennet is added; and when it is set and cooled, a little nutmeg and a few spoonfuls of Devonshire cream may be carefully placed on it.

Egg Flip

Take the yolk of an egg, beat it up well with an ounce of milk, and add to it two ounces of port wine, or half-an-ounce of brandy, sweeten it to taste, and grate a little nutmeg over it if liked. It can be used either cold or warm, but it must not be boiled.

Scrambled Eggs

Beat up two eggs in a basin with a little pepper and salt. Melt a piece of butter the size of a walnut in a small saucepan, put in the egg, and stir it with a spoon till nearly set. Serve on buttered toast on a very hot plate.

Water-Gruel

Mix two small tablespoonfuls of groats or fine oatmeal in a little cold water, till it is a smooth paste, add to it half-a-pint of boiling water, stirring it well, and boil it for quarter of an hour.

Milk-gruel is made in exactly the same way, only substituting milk for water.

Imperial Drink

Take one drachm of cream of tartar, the juice of a lemon, and about quarter of a pound of loaf sugar. Mix in a jug, and pour upon it a pint of boiling water. It is a refreshing drink for feverish patients, and is often ordered in cases of Bright's disease. If it is sweetened with saccharin instead of sugar, it can be given to diabetic patients.

Lemonade

Peel three lemons very thinly, so as to remove only the yellow part of the rind ; pare off all the white, and cut the pulp into thin slices, removing the pips ; put the pulp into a jug with as much of the rind as is liked, add about half a pound of loaf sugar, and pour on it about a quart of *boiling* water. More sugar or water can be added afterwards, according to taste. It is very good when drunk quite hot, or it can be used with a lump of ice in it for a cooling drink.

Linseed Tea

Put half-an-ounce of whole linseed, with a pint of boiling water, into a covered jar. Leave it on the hob, or in a cool oven, for two or three hours. Strain it, and flavour it to taste with lemon and sugar, adding more hot water if it seems to be too thick. It should be used quite hot, and it is very grateful to a sore throat or chest.

Oatmeal Drink

Boil a good tablespoonful of coarse Scotch oatmeal in a quart of water for about twenty minutes, stirring it now and then. Add ginger, lemon, or sugar, as may be liked. It is a refreshing drink for thirsty people, and there is a certain small amount of nourishment in it.

Oatmeal Porridge

Boil one pint of water in a saucepan, and while it boils, sift in the dry oatmeal with one hand, while you stir with the other. Boil it for twenty minutes. It must be stirred the whole time, unless it is made in a double saucepan. Serve it in a soup plate, with a jug of milk or cream, and sugar, salt, or treacle, according to taste.

Peptonised Milk (see page 25)

Rice Water

Wash thoroughly an ounce of rice in cold water, and boil it in a pint of water for an hour. Strain it before using.

Suet and Milk

Cut half-an-ounce of fresh beef suet as fine as possible, mix it with half-a-pint of milk, and boil it till the suet is quite melted. Skim it and strain, and pour it into a hot cup. It is good for a cold in the head or a sore chest.

Toast and Water

Toast a slice of stale bread very brown, but without burning it; put a pint of boiling water into a jug, and plunge the toast into it. Let it stand till cold, and pour it off the toast.

Treacle Posset

Warm a pint of milk, add a large tablespoonful of treacle to it, and boil for five minutes.

A dessertspoonful of golden syrup added to a teacupful of boiling water and sipped occasionally sometimes relieves a cough.

White Wine Whey

Boil half-a-pint of milk, pour into it a wineglassful of sherry, and stir till it curdles. Strain before serving. Hot water may be added to make it any desired strength.

Wine Jelly

Put an ounce of isinglass (or gelatine that has been well soaked) and half-an-ounce of sugar into a saucepan over the fire with just enough water to well cover it, until it is all dissolved. Add half-a-pint of wine, and strain it through a jelly-bag or a piece of clean muslin into a mould to set.

Orange Jelly

Soak an ounce of gelatine in cold water for twelve hours. Take half-a-pound of white sugar and boil it in half-a-pint of water. Squeeze into it the juice of six oranges and a lemon, with the thinly-peeled rind of the lemon and one orange. Add the soaked gelatine when it is boiling, and when the gelatine is quite dissolved, strain through muslin into a shape.

VOCABULARY OF MEDICAL TERMS

Abnormal, not natural.
Acne, an eruption of pustules, generally about the face.
Accommodation, the power of adapting the eye to various distances.
Acupuncture, pricking with a needle.
Acute, rapid, as applied to disease ; severe, as to pain.
Adenoids, small growths at the back of the nose and throat.
Adhesions, abnormal union of parts, caused by inflammation.
Amenorrhœa, suppression of menstruation.
Anæmia, deficiency in the blood, either in quantity or quality.
Anæsthesia, loss of sensation.
Anasarca, general dropsy.
Aneurism, a dilatation in the course of an artery.
Ankylosis, bony union of the joints.
Anodyne, something that eases pain.
Anorexia, want of appetite.
Anthrax, malignant pustule; charbon. A very infectious disease caused by a bacillus present in diseased cattle.
Antipyretics, remedies for reducing temperature.
Antiseptic, something to prevent putrefaction.
Anuria, non-secretion of urine.
Aphasia, loss of speech.
Aphonia, loss of voice.
Aphthæ, small grey ulcers about the mouth and tongue.
Apyrexia, absence of fever.
Aqua, water.
Arcus senilis, a white, opaque ring round the cornea, seen in old people.
Articulation, joint.
Arthritis, arthralgia, inflammation, pain, in the joints.
Ascites, a collection of fluid in the abdomen.
Asepsis, freedom from organisms. "Surgical cleanliness."
Aspirate, to withdraw fluid from a cavity by means of an exhausted bottle.
Asphyxia, loss of animation (literally, loss of pulse).
Asthenia, exhaustion.
Astigmatism, defect in the sight, owing to unequal curvatures of the cornea.
Ataxy, inco-ordination ; irregular, disorderly muscular movements.
Atrophy, wasting.
Aura, the sensations that sometimes precede an epileptic attack.
Autopsy, post-mortem examination.
Axilla, the armpit.

Bacilli, a group of bacteria.
Bacteria, micro-organisms, germs.
Bifid, cleft in two parts.
Bistoury, a narrow-bladed surgical knife.
Bougie, an instrument, shaped like a candle, for dilating passages.
Bulla, a large blister on the skin.
Bursa, a small sac near a joint, containing fluid.

Cachexia, malnutrition ; bad condition of the body.
Cadaver, the dead body.
Calculus, a stone, a concretion in the body.
Callus, new bony growth thrown out near the site of a fracture.
Carcinoma, cancer.
Cardiac, belonging to the heart.
Caries, decay or death of bone.
Casts, moulds of the tubules of the kidney seen by the microscope in certain diseased conditions of the urine.
Catalepsy, a nervous affection in which the power of voluntary movement is lost.
Catamenia, the monthly discharge.
Cataplasm, a poultice.
Catarrh, increased flow from a mucous membrane.
Cathartics, strong purgative medicines.
Caustics, substances which destroy living tissue.
Cervical, belonging to the neck.
Chronic, lasting a long time, as opposed to acute.
Charbon, anthrax.
Cholaemia, retention in the blood of abnormal hepatic secretions.
Chyluria, milky urine containing chyle.
Cicatrix, scar.
Cirrhosis, a chronic inflammation of the liver, kidney, or lung.
Clinical, belonging to a bed ; clinical teaching = bedside teaching.
Clonus, short spasmodic contractions of the muscles.
Collapse, extreme prostration.
Collyrium, an eye-wash.
Coma, stupor, profound insensibility.
Congenital, existing from birth.
Congestion, accumulation of blood in an organ.
Coryza, profuse discharge from the nasal mucous membrane.
Costal, belonging to the ribs.
Crisis, the turning-point in a disease.
Cutaneous, on the surface of the skin.
Cuticle, the outer layer of the skin.
Cyanotic, bluish, livid.

Cyst, an abnormal sac in the body, a tumour containing fluid.
Cystitis, inflammation of the bladder.

Decubitus, the recumbent position.
Defæcation, the discharge of fæces.
Deglutition, the act of swallowing.
Desquamation, "peeling"; shedding small scales of epidermis.
Diagnosis, the recognition of the disease from which a patient is suffering.
Diaphoresis, sweating.
Diaphragm, the large muscle separating the thoracic and abdominal cavities.
Diathesis, predisposition to a certain disease.
Dicrotic, rebounding; applied to the pulse.
Diplopia, double vision of a single object; seeing double.
Discrete, distinct; applied to spots, etc. on the skin.
Diuresis, an increased flow of urine.
Diuretics, medicines to promote diuresis.
Dorsum, the back.
Duct, a canal or passage.
Dynamometer, an instrument for testing muscular strength.
Dysmenorrhœa, painful menstruation.
Dysphagia, difficulty in swallowing.
Dyspnœa, difficulty in breathing.

Ecchymosis, extravasation of blood; bruise.
Eclampsia, a fit; a spasm with loss of consciousness.
Embolus, a plug which obstructs a blood-vessel.
Emphysema (surgical), a condition in which air has escaped into the tissues.
Empyema, a collection of pus in the pleural cavity.
Enterica, typhoid fever.
Enteritis, inflammation of the small intestines.
Epiphysis, the end of the long bones, from which they grow.
Epispastic, a blistering agent.
Epistaxis, bleeding from the nose.
Epithelium, the superficial layer of the mucous membrane.
Erythema, a patchy redness of the skin.
Eserine, a preparation of Calabar bean, used for contracting the pupil.
Exacerbation, aggravation of the symptoms of disease.
Exanthem, a fever accompanied by a rash.
Exophthalmia, a protrusion of the eyeball.
Extravasation, effusion of fluid into the tissues.
Exudation, oozing of fluid through the skin, or through the coats of vessels.

Fæces, the contents of the intestine.
Fauces, the back of the mouth.
Febrile, feverish.

Fistula, an unnatural opening by which an organ communicates with the outside of the body, or with another organ.
Flatus, gas in the intestinal canal.
Flexion, bending.
Fluctuation, the undulation of fluid, as in an unopened abscess, or in the abdominal cavity.
Fœtus, an unborn child.
Fontanelles, the spaces between the bones of the skull in infants.
Foramen, a hole or opening.
Fotus, a fomentation.

Gangrene, death of a part ; mortification.
Gastralgia, pain in the stomach.
Gastric, belonging to the stomach.
Gastrotomy, opening the stomach for the purpose of artificial feeding.
Gland, an organ of secretion.
Glossal, belonging to the tongue.
Glaucoma, an inflammatory disease of the eyeball.
Glycosuria, a condition in which the urine contains grape sugar.
Granulations, small red prominences on the surface of healing wounds.
Gummata, syphilitic tumours.
Gutta, a drop.
Gynæcology, the study of the diseases of women.

Hæmatemesis, the vomiting of blood.
Hæmaturia, blood present in the urine.
Hæmatoma, a tumour containing blood.
Hæmoglobin, the colouring matter of the blood.
Hæmophilia, a disease in which haemorrhages are stopped with difficulty.
Hæmorrhage, bleeding.
Hæmostatic, a styptic ; something that stops bleeding.
Hæmoptysis, coughing blood from the lung.
Haustus, a draught.
Hemi, denoting half.
Hemiplegia, one-sided paralysis.
Hepatic, belonging to the liver.
Hernia, protrusion of any organ outside its normal cavity.
Herpes, a vesicular eruption.
Hydatid tumours, cysts containing fluid produced by a certain parasite.
Hydrocephalus, fluid collected in the skull.
Hydrothorax, pleural effusion ; fluid collected in the chest.
Hyperæmia, an increased supply of blood to a part.
Hyperæsthesia, excessive sensibility.
Hypertrophy, overgrowth.

Hypnotic, producing sleep.
Hypogastrium, the surface of the abdomen below the umbilicus.
Hysterectomy, the removal of the uterus.

Icterus, jaundice.
Idiopathic, arising without apparent cause.
Idiosyncrasy, peculiarity of the individual constitution.
Ileum, part of the small intestine.
Ilium, the upper part of the hip bone.
Immune, free from risk of infection.
Impacted, wedged in.
Impetigo, a pustular eruption, generally due to pediculi.
Inanition, exhaustion from want of food.
Inco-ordination, want of balance in movements.
Incubation, hatching; the period between infection and the appearance of the first symptoms.
Indolent, painless.
Induration, hardening.
Infarct, an embolism.
Ingesta, substances taken into the stomach.
Insolation, sunstroke.
Insomnia, sleeplessness.
Integument, a covering.
Inunction, rubbing in ointment.
-itis, a termination signifying inflammation.

Jugular, relating to the throat.

Keloid, resembling a tumour.
Keratitis, inflammation of the cornea.
Keith's tubes, glass drainage tubes.
Klebs Löffler bacilli, the germs that are believed to produce diphtheria.
Koumiss, fermented mare's milk.

Labial, belonging to the lips.
Lactation, the period of suckling.
Lardaceous, resembling lard; a degenerative change in the organs, generally occurring in chronic diseases with much suppuration.
Laparotomy, abdominal section.
Laryngoscope, an instrument for examining the throat.
Laxative, a mild aperient.
Lesion, an injury; derangement.
Leuchæmia, Leucocythemia, a disease of the blood, in which there is great increase of the white corpuscles.
Leucocytes, the white corpuscles of the blood.

Leucorrhœa, a whitish vaginal discharge.
Lientery, diarrhœa with undigested food in the stools.
Lipoma, a fatty tumour.
Lithotomy, removal of a stone by incision into the bladder.
Lithotrity, crushing a stone in the bladder.
Lochia, vaginal discharge after labour.
Lordosis, a kind of spinal curvature.
Lumbago, pain in the loins.
Lupus, a tuberculous affection of the skin.
Lymph, the contents of the lymphatic vessels ; also used for the fluid poured out in healing wounds.
Lysis, the gradual termination of fever.

Macula, a spot (on the skin).
Malignant, a term generally used instead of cancerous.
Malingering, feigning disease.
Mammary, relating to the breast.
Marasmus, wasting ; emaciation.
Maxillary bone, the jaw bone.
Meatus, an opening into a passage.
Mediastinum, the space in the chest between the pleuræ.
Melæna, tar-like motions, containing altered blood.
Meningitis, inflammation of the membranes covering the brain.
Menorrhagia, excessive menstruation.
Menstruation, the monthly period.
Mesentery, part of the peritoneum.
Metabolism, chemical change.
Metritis, inflammation of the uterus.
Microbe, a micro-organism, a germ.
Micrococci, spherical organisms.
Micturition, passing urine.
Morbus, disease.
Moribund, about to die.
Mucus, the viscid fluid secreted by mucous membranes.
Multilocular, containing several cavities.
Muscæ Volitantes, flying spots before the eyes.
Myalgia, pain in the muscles.
Myelitis, inflammation of the spinal cord.
Myocarditis, inflammation of the heart muscle.
Myopia, short sight.
Myxœdema, a disease dependent on atrophy of the thyroid gland.

Nævus, a birthmark.
Narcotic, relieving pain and producing sleep.
Nares, the nostrils.

Nates, the buttocks.
Necropsy, a post-mortem examination.
Necrosis, death of tissue ; generally applied to bone.
Neoplasm, a new growth.
Nephrectomy, excision of the kidney.
Nephritis, inflammation of the kidney ; Bright's disease.
Neuralgia, pain in a nerve.
Neurasthenia, nervous exhaustion.
Neuritis, inflammation of a nerve.
Neurosis, disease of the nervous system, not organic.
Normal, natural, ordinary.
Nystagmus, an oscillating motion of the eyes.

Objective, external, outward.
Occiput, the back of the head.
Occlusion, a blocking up.
Ocular, relating to the eye.
Œdema, collection of fluid in the cellular tissue ; swelling.
Olecranon, the elbow.
Omentum, the fatty tissue covering the intestines in front.
Orthopnœa, difficulty of breathing, which compels an upright position.
Osseous, bony.
Osteotomy, a cutting operation on bones.
Otitis, inflammation of the ear.
Otorrhœa, purulent discharge from the ear.
Ovaritis, inflammation of the ovary.
Oxymel, a mixture of honey and vinegar.
Ozæna, foul discharge from the nose.

Pancreas, a gland behind the stomach.
Papilloma, wart-like tumour.
Paracentesis, tapping ; withdrawing fluid from a cavity.
Paraplegia, paralysis of lower half of the body.
Parasite, a plant or animal living on the body of another.
Paregoric, compound tincture of camphor (containing opium).
Paresis, paralysis.
Parietes, walls.
Parotitis, inflammation of the parotid gland ; mumps.
Paroxysm, fit, periodical attack.
Pathognomic, characteristic of a certain disease.
Pathology, study of the nature of disease.
Pectoral, belonging to the chest.
Pedicle, a stem (as of a tumour).
Pediculi, lice.
Pedunculated, attached by a pedicle.

Peri-, a prefix signifying round about.
Perineum, the space between the anus and genitals.
Peristalsis, the natural movement of the intestines.
Perityphlitis, inflammation about the cæcum ; appendicitis.
Pertussis, whooping-cough.
Petechiæ, spots on the skin ; cutaneous hæmorrhages.
Phlebitis, inflammation of a vein.
Photophobia, intolerance of light.
Phthisis, tuberculous disease of the lungs.
Pipette, a small glass tube.
Placebo, a medicine given to satisfy the patient.
Pleurisy, inflammation of the pleura.
Pleurodynia, pain in the side.
Plumbism, lead poisoning.
Pneumonia, inflammation of the lung.
Pneumothorax, air in the pleural cavity.
Podagra, gout.
Polyuria, an increased flow of urine.
Polypus, a tumour growing from a mucous membrane.
Præcordial, in front of the heart.
Prognosis, forecast of the course of a disease.
Pronation, the act of laying the palm of the hand downwards.
Prophylaxis, preventive treatment.
Psychosis, mental disease.
Ptomaines, substances formed during the decomposition of organic matter.
Ptosis, drooping of the upper eyelid.
Ptyalism, salivation.
Pulmonary, belonging to the lung.
Purpura, a disease accompanied with hæmorrhagic spots on the skin.
Purulent, having the character of pus.
Pustule, a minute abscess.
Pyæmia, blood-poisoning.
Pyelitis, inflammation of the pelvis of the kidney.
Pyuria, pus in the urine.

Rachitis, rickets.
Radial, belonging to the radius.
Radical, thorough ; treatment that destroys disease.
Râles, sounds in the lungs produced by air bubbles and fluid mixed.
Recrudescence, becoming sore again, a return of the original symptoms.
Reduction, restoring displaced parts.
Reflex action, involuntary action following stimulus to a nerve.
Renal, belonging to the kidney.
Resection, excision of a portion of bone or of intestine.
Resolution, gradual disappearance of disease.

Retina, a structure at the back of the eye connected with the optic nerve.
Rhinitis, inflammation of the nose.
Rhonchi, snoring sounds produced in the lungs.
Rickets, a constitutional disease of children, affecting the bones.
Rigor, a chill, accompanied by shivering.
Risus sardonicus, the spasmodic grin seen in tetanus.
Rötheln, **Rubeola**, German measles.

Saline, salt.
Sarcinae, organisms found in the diseased stomach.
Sarcoma, malignant growth.
Sayre's jacket, a rigid plaster support used in spinal disease.
Scabies, the itch.
Scirrhus, a kind of cancer.
Sclerosis, a hardening degeneration of the spinal cord.
Sclerotic, the white of the eye.
Scybala, hard lumps of fæces.
Sebaceous, fatty, like suet.
Septic, putrefying.
Septicæmia, blood-poisoning.
Sequela, a disease following another disease as a consequence of it, as paralysis may follow diphtheria.
Serum, the watery part of the blood.
Shingles, herpes zoster, a vesicular eruption.
Specific fever, the infectious fevers.
Specific gravity, the weight of any substance compared with the weight of water.
Speculum, an instrument for examining cavities.
Sphygmograph, an instrument for making pulse tracings.
Spica, a figure of eight bandage.
Sputum, what is spit out, expectoration.
Staphylococci, micrococci growing in clusters.
Stenosis, a narrowing.
Stercoraceous, fæcal.
Stertorous, snoring.
Strabismus, squint.
Strangulation, constriction, choking.
Strangury, painful, difficult, frequent micturition.
Streptococci, micrococci growing in strings.
Stomatitis, inflammation of the mouth, thrush.
Stricture, narrowing of a tube or duct.
Stridor, noisy breathing.
Stridulous, making a harsh noise in breathing.
Strumous, a term often used for tuberculous.

Stupes, cloths wrung out of hot water ; fomentations.
Styptic, arresting hæmorrhage ; astringent.
Subacute, midway between acute and chronic.
Sudamina, a sweat rash ; minute vesicles on the skin.
Sudorific, sweat producing.
Suppository, medicine introduced into the rectum in a solid form.
Suppuration, the process of forming pus.
Suture, a stitch ; a kind of joint in the skull.
Syncope, fainting.
Synovitis, inflammation of the synovial membrane.

Tabes, wasting.
Talipes, club foot.
Tampon, a plug of lint, gauze, etc.
Taxis, reduction of a hernia by manipulation.
Temporal, belonging to the temples.
Tenesmus, painful, ineffectual straining to open the bowels or bladder.
Tenotomy, the division of a tendon.
Tetanus, lockjaw.
Therapeutics, the treatment of disease.
Thoracic, belonging to the chest or thorax.
Thrombosis, blood-clot formed in a vessel.
Thyroid cartilage, "Adam's apple."
Tinnitus, "Singing in the ears," subjective sensations of sound.
Tophi, chalk stones ; concretion seen on the fingers, ears, etc., in gout.
Torsion forceps, forceps used for twisting the vessels.
Torticollis, wry neck.
Toxæmia, a poisoned state of the blood.
Toxic, poisonous.
Trachoma, inflammation of the follicles of the eyelids.
Transudation, an oozing through the tissues.
Traumatic, caused by a wound.
Trephining, removing a circular piece of bone from the skull.
Trocar, a needle or other sharp-pointed instrument, enclosed in a tube (cannula) and used for withdrawing fluid from cavities.
Trochiscus, a lozenge.
Trophic, nourishing.
Tubercle, a nodule produced by the tubercle bacilli—rod-like organisms which cause phthisis, etc.
Tuberculosis, the characteristic inflammation produced by the tubercle bacilli.
Tumefaction, swelling of a part.
Turgid, swollen.
Tympanum, the middle ear.

Ulcer, an open sore.

Umbilicus, the navel.
Unguent, an ointment.
Uræmia, a state occurring in different forms of Bright's disease, causing convulsions, coma, etc.
Urea, a constituent of the urine.
Ureter, the tube conveying urine from the kidney to the bladder.
Urethra, the tube conveying urine from the bladder.
Urticaria, nettlerash.

Vagus, the pneumogastric nerve, which starts from the brain, and supplies the heart, lungs, etc.
Varicella, chicken-pox.
Varicose, a term applied to tortuous, dilated veins.
Variola, small-pox.
Vascular, belonging to vessels.
Venesection, the opening of a vein ; bleeding.
Vertigo, giddiness.
Vesicles, very small blebs, filled with clear fluid.
Viable, capable of living.
Virus, a poison.
Viscera, the organs contained in the thorax and abdomen (singular viscus).
Vulva, the external female genitals.

Zona, shingles ; herpes zoster.
Zymotic fevers, a term used for infectious fevers such as measles.

TERMS AND ABBREVIATIONS USED IN PRESCRIPTIONS

	ā ā	of each.
Alternis diebus,	alt. die	every other day.
Ante cibos,	a. c.	before food.
Aqua destillata,	aq. dest.	distilled water.
Bis die,	b. d.	twice a day.
Cataplasma,		a poultice.
Cochleare,	coch.	a spoonful.
Cras mane,	c. m.	to-morrow morning.
Cum,	c̄.	with.
Emplastrum lyttae,		a blister.
Fiat,	ft.	let there be made.
Gutta,		a drop.
Haustus,	haust.	a draught.
Hac nocte,	h. n.	to-night.
Hora somni,	h. s.	at bed-time.
Minim,	m.	a drop; $\frac{1}{60}$ of a fluid drachm.
Mistura,	mist.	a mixture.
Nocte et mane,	n. et m. or n. mque.	night and morning.
Octarius,	O.	a pint.
Omni hora,	o. h.	every hour.
Post cibos,	p. c.	after food.
Pro re nata,	p. r. n.	occasionally.
Pro applicatione,	p. a.	to be applied.
Pulvis,	pulv.	a powder.
Quantum sufficit,	q. s.	a sufficient quantity.
Quotidie,		daily.
Recipe,	R	take.
Semis,	ss.	half.
Sinapis,		mustard.

Signa,	s.	write.
Si opus sit,	s. o. s.	if necessary.
Statim,	st.	immediately.
Sumendum,	sum.	to be taken.
Ter die sumendum,	t. d. s.	three times a day.
Utendum,	ut.	to be used.

WEIGHTS AND MEASURES

Minim,	m.	a drop.
grain,	gr.	
20 grains,	=	one scruple ℈i.
60 grains,	=	one drachm ʒi.
60 minims,	=	one fluid drachm.
8 drachms,	=	one ounce ℥i.
20 ounces,	=	one pint Oi.
8 pints	=	one gallon.

A small teaspoonful is about equal to	a drachm.
,, ,, dessertspoonful ,, ,, ,,	two drachms.
,, ,, tablespoonful ,, ,, ,,	four drachms.
Two small tablespoonfuls ,, ,,	an ounce.
A pound avoirdupois is equal to	7000 grains.

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